ForesTalk

RESOURCE MAGAZINE SPRING 1981

2007-04847/

ForesTalk

Volume 5 Number 1 Spring 1981

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Cover Photo: Spring brings out the best in flowers, but the few-flowered shooting star on this issue's cover is more than just a colourful indicator of the season. It also tells foresters about the nature of the soil in the area, as well as other important information about the local forest ecosystem. This is because of a process known as ecosystem classification, and it's sweeping the province. The cover photograph is by Frank Boas of Vancouver.

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The three feature articles in this issue of ForesTalk point out the wide range of complex and interconnected activities covered by the term "forest management."

One article illustrates the fact that long-term forest management goals must be established to meet future timber needs; a second article describes the challenge involved in putting multiple-use forest management into practice; the third highlights the benefits to be gained from an improved understanding of the ecology of forest trees.

These three aspects of forest management figure prominently in the Ministry of Forests' management programs for British Columbia's forests.

Tom Waterland

Hon. Tom Waterland, *Minister of Forests*

ForesTalk Resource Magazine is published quarterly by the Province of British Columbia, Ministry of Forests, Information Services Branch, 1450 Government Street, Victoria, B.C. V8W 3E7. Telephone: (604) 387-5985.

Designed to encourage interest, discussion and understanding of British Columbia's forest, range and recreational resources, ForesTalk is available free on request. Second class mailing registration No. 3863. International Standard Serial Number ISSN 0700-1770. ForesTalk welcomes submissions from professional writers and photographers on themes related to the B.C. forests and their uses. Address enquiries to the editor.

Province of British Columbia Ministry of Forests

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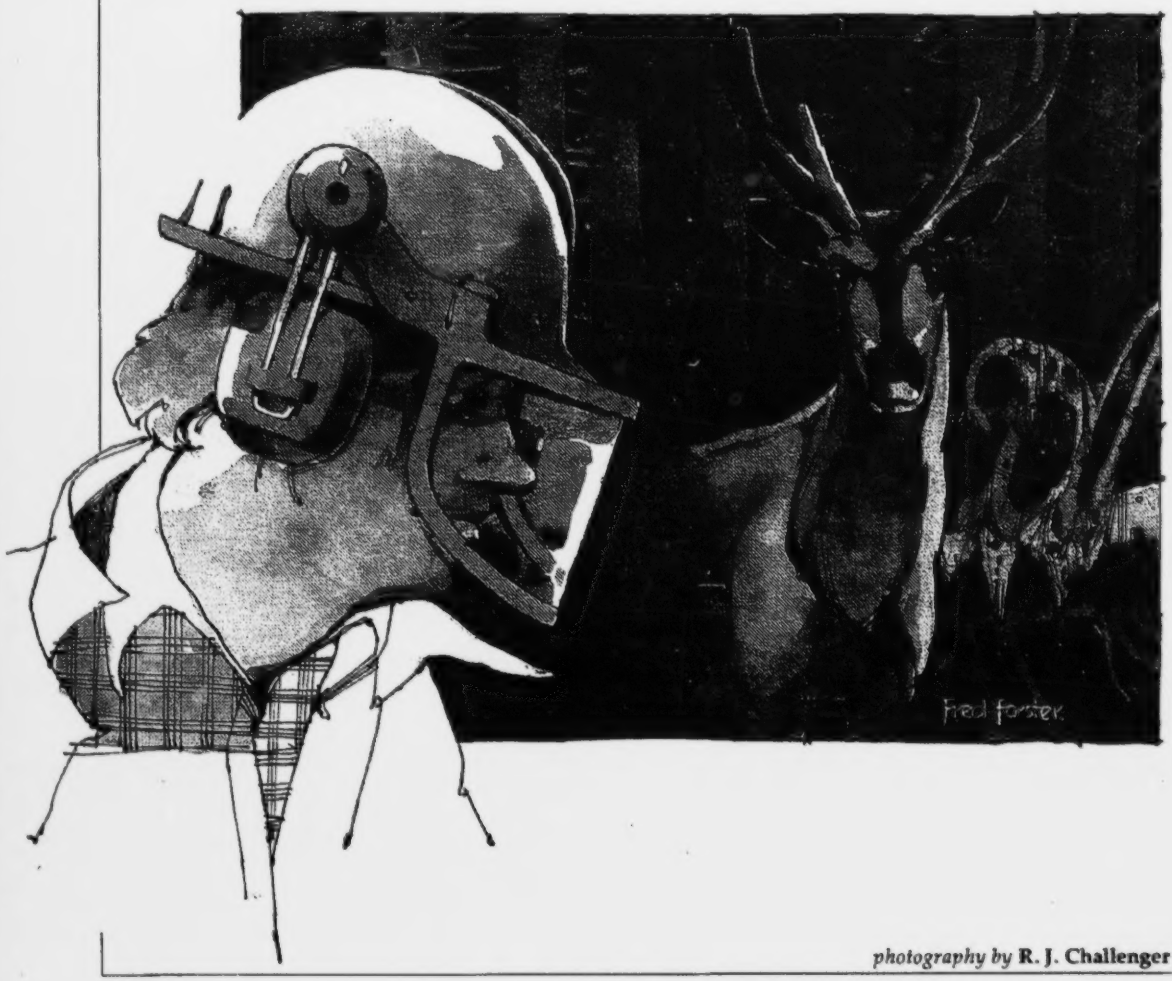
CARIBOU AND LOGGERS MEET HEAD ON

by **Diane Swanson**

Nobody ever expected loggers and caribou to coexist, and until quite recently they didn't have to. But increased pressure to log at higher elevations has today brought skidders into the heart of caribou winter range. Committed to integrated resource management, the Ministry of Forests has some difficult decisions to make.



photography by **R. J. Challenger**

"Okay, I'm picking up a signal ... It's getting stronger ... stronger. Keep circling. We must be close."

The pilot banks to the right and brings the helicopter around again. Below, the mountains of the North Thompson watershed northeast of Clearwater lie buried under heavy March snow. Biologist Ted Antifeau concentrates on the bleeps coming from his earphones. Somewhere among the sparse, scraggy trees beneath him is a caribou cow wearing a radio transmitter in a collar around her neck.

For a year now Antifeau has been tracking four radio-collared cows, each from a distinct caribou band. As part of a study for both the Ministry of Forests and the Fish and Wildlife Branch of the Ministry of Environment, he is trying to get a fix on just where the caribou roam.

Not surprisingly, the radio signals from this one cow seem to be coming from the higher elevations, habitat generally preferred by caribou. Only when the snow gets too deep do the caribou move down the mountainside. But in the North Thompson, the lower slopes are looking less and less attractive to the animals as patches of clearcuts creep up the mountains.

On the third circle around, Antifeau spots a tangled maze of deep footprints winding across the snow. They snake their way among the trees before coming together in a meandering path. The pilot sets down in a nearby clearing and Antifeau steps out into the snow. As the helicopter lifts again, nine startled woodland caribou rush out from among the trees and stop abruptly — almost in a row. Their large, blunt muzzles, normally carried low, are raised towards Antifeau; their very short tails stand straight up. As the sounds from the helicopter fade, curiosity overcomes their caution and one of the cows steps forward; three others follow.

Steady and intense, their gaze meets his. It is as though man and caribou are meeting to discuss opposing territorial claims. Of course, the caribou don't know of plans for more logging within their range. They merely pause to satisfy their curiosity, then turn abruptly and run out of sight. Antifeau is left to explore their world.

The elevation here is 1860 metres; the widely-spaced, scraggy fir and spruce trees — up to 150 years old — are of no possible interest to any logger. But to the caribou they mean survival. Besides providing essential winter cover, the branches of these trees are heavily draped with

life-sustaining lichens — fungi and algae that grow together in a symbiotic relationship. The lichens appear to be well browsed as high up the trees as the caribou can reach. Everywhere coarse black strands of the beard-like plants lie scattered on the snow, like fallen crumbs from a dinner table. Although caribou feed on many other plants, including grass, mushrooms, horsetails and a variety of shrubs, these arboreal lichens are often the only food available in deep snow.

Antifeau measures the depth of the tracks the band has left behind. Despite their large, crescent-shaped hooves which spread widely for support on snow, the caribou are sinking almost to their chests. One more heavy snowfall and they will be forced to head down the slopes until the snow has packed down.

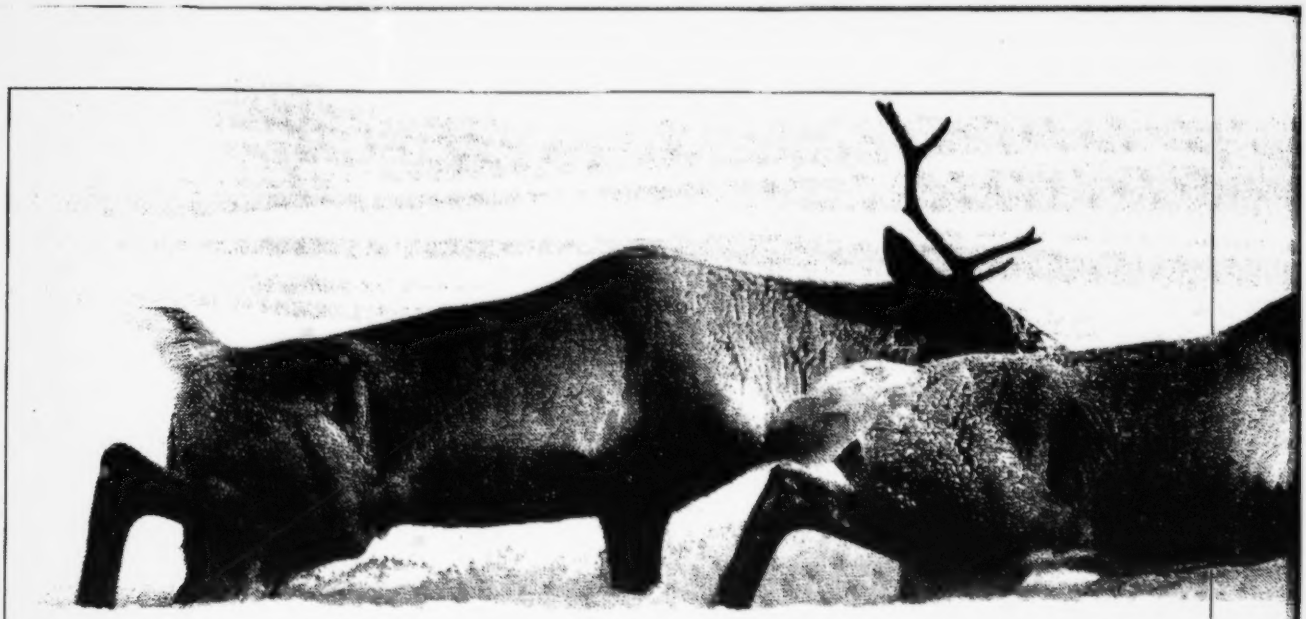
Although that alternative is open to them this year, the future may provide fewer options. In moving down the slopes, the caribou enter forest considered to be productive for logging, and that's where the problem lies. Says Mike Wilkins, Kamloops Ministry of Forests Timber, Range and Recreation Manager: "For six years we have held wide-ranging discussions with the Fish and Wildlife Branch, trying to find a compromise solution to the basic incompatibility between an industry that requires the trees that grow in caribou habitat and the caribou themselves, which require the lichens from those same trees."

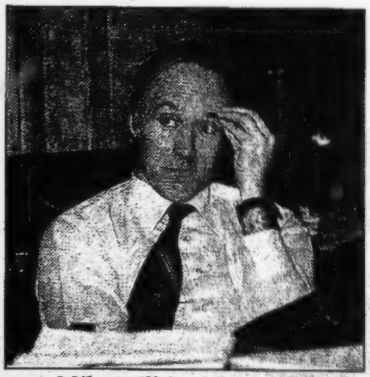
The Fish and Wildlife Branch has requested a moratorium on logging above elevations of 1650 metres, but both the Ministry of Forests and the forest industry feel that such a moratorium would tie up large tracts of good quality timber stands — stands they say they can't afford to lose. The Ministry of Forests has identified wood supply problems for the North Thompson, and timber shortages which could occur in the future may severely affect the local communities of Avola, Birch Island, Blue River, Clearwater and Vavenly. Here, the forest industry is the major employer. Weyerhaeuser, Balco Industries, and Clearwater Timber Products, together with a number of smaller firms, generate over $35 million from the immediate area and employ more than 900 people.

On the other hand, how might further high-elevation logging affect the caribou?

At one time caribou herds were distributed from north to south throughout B.C. Once classified into two sub-species — "Osborne" caribou in the north and

There are an estimated 10,000 to 20,000 caribou in British Columbia. Most of these inhabit the northern part of the province; the small, scattered bands south of the Yellowhead Highway find it difficult to adapt to changes in their forest habitat brought about by a general increase in forest use. The caribou of the North Thompson *(pages 4–5)* ***spend from mid-winter until the spring thaw high up in the snow-filled mountains, browsing on the life-sustaining lichens*** *(below)* ***which cover the old-growth fir and spruce.***





Mike Wilkins (above), Timber, Range and Recreation Manager for the forests ministry's Kamloops Forest Region: "For six years we have tried to find a compromise solution to the basic incompatibility between the forest industry that requires the trees which grow in caribou habitat, and the caribou themselves that require the lichen from those same trees."

"mountain" caribou in the south — the animals are now considered to be a single species, woodland caribou (*Rangifer tarandus caribou*). Since 1900 their numbers and their range have decreased markedly until, today, there remain an estimated 10,000 to 20,000 animals, chiefly in the northern part of the province. In areas south of the Yellowhead Highway, where caribou have suffered the greatest decline, they now number about 2,000 and their habitat is limited to parts of the Columbia and Rocky Mountains and to the southern part of the Hazelton Mountains south through Tweedsmuir Park.

Both predation and hunting have contributed to the decline in caribou populations, especially because caribou have a very low rate of reproduction; each year few calves are produced to replace those that are killed. It is estimated that illegal hunting has taken more animals than legal hunting, partly because logging and mining roads have provided greater access to the herds. And certainly loss of habitat through forest fires, land development, and logging is a major cause for the dwindling numbers. But because so little is actually known about the animals' behaviour, wildlife and forest managers cannot readily agree on which factors most affect caribou survival.

In the North Thompson area, wildlife managers suggest that the loss of forest habitat suitable for caribou is the main cause for the declining caribou numbers; forest managers tend to point the finger at the legal and illegal hunting activities of the past two decades. But no one will deny that logging operations are beginning to infringe on caribou habitat — and that raises serious concerns.

Caribou are not nearly so versatile in their response to change as are other members of the deer family. If logging removes old forests that once provided them with winter cover and food, or disrupts areas that were traditional grounds for rutting, calving or migration, caribou have a difficult time adapting. The result of any disturbance to their habitat is almost sure to be a sharp drop in numbers.

The North Thompson region presently supports approximately 300 caribou, about half the number that inhabited the area in the early 1960s. About 250 of these dwell mainly within Wells Gray Provincial Park, which some resource managers feel provides good enough habitat to ensure the preservation of the herd, even if numbers drop further. They also note that non-commercial forest north to Bowron Lake Park, and east to Mount Robson Park and Jasper National Park, extend the potential range of the caribou. Over time there could be contact between different herds in these areas, allowing for the genetic mixing essential to their survival.

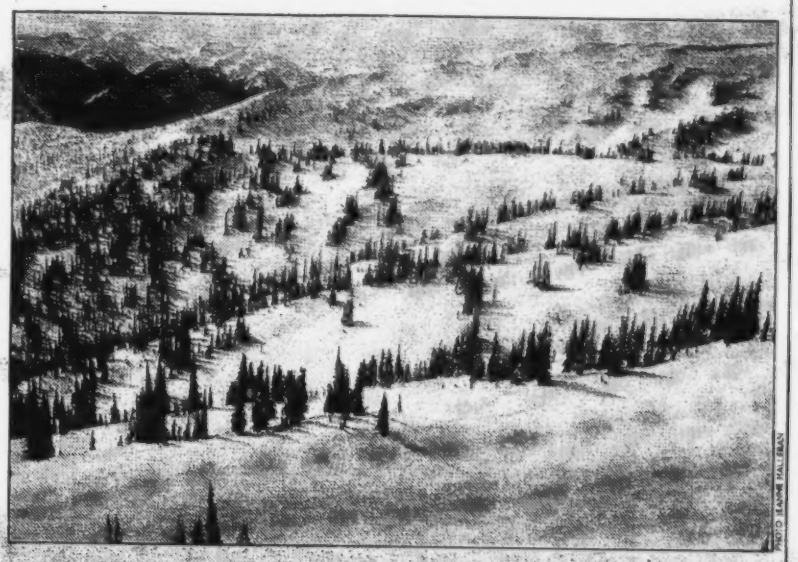
But Wally Macgregor, Fish and Wildlife biologist in charge of ungulate management, doesn't feel that Wells Gray Park by itself is the full answer to maintaining the North Thompson caribou population. Says Macgregor: "I'm just not prepared to say that our parks are sufficient habitat to preserve caribou in B.C. I think it's too big a chance to take." He

points out that although the Wells Gray herd is probably the biggest in the southern half of the province, one major disease could wipe it out.

The simplest solution to any logging-caribou conflict would be to give the animals their own habitat — a caribou reserve. But putting aside forest habitat for caribou, or even extending the harvest age of trees, is an expensive proposition. The cost to government and industry to maintain mature forests for such a reserve is difficult to assess, although annual costs ranging higher than $100,000 per animal have been tossed about. On the other hand, as Fish and Wildlife official Ken Sumanik summarizes: "Putting aside forest for caribou is also putting it aside for grizzlies, marten, wolverine, porcupines, watershed use, and outdoor recreation. These are benefits, not costs, to society."

A caribou reserve in the North Thompson would certainly affect the local forest industry, and Weyerhaeuser's forestry and planning manager Steve Tolnai comments: "If some specific areas are identified as being really very important to the caribou, then let's look at those. But drawing a pencil line on a map around certain elevations scares the daylights out of me, because it's not going to do anything besides lock somebody else out of that area."

The regional Fish and Wildlife biologist for the North Thompson area is Ralph Ritcey. He says that foresters have to recognize that caribou winter habitat requirements can't be met simply by setting aside small parcels of land. The lichens the caribou feed on are not found in concentrated areas, but rather are distributed more or less equally over a wide area. Ritcey notes as well that the proposed caribou reserve in the North Thompson, mainly at elevations above 1650 metres, is an area where timber values are relatively low.



The basic incompatibility between logging and caribou management faces every part of B.C. where caribou habitat lies in productive forests. In the Prince George area, some caribou habitat has already been lost, but as yet there's no actual shortage. Here, areas critical to caribou survival still have to be identified, but because commercial timber stands

Although it's late in March, the mountains of the North Thompson watershed are still waist deep with snow (pages 6-7). Soon the caribou will begin their spring descent to lower elevations where they will remain until returning to the alpine meadows in June. Further south, the caribou of Lardeau Valley (above) at the north end of Kootenay Lake leave behind a winding trail of hoof prints as they work their way down the mountain side.

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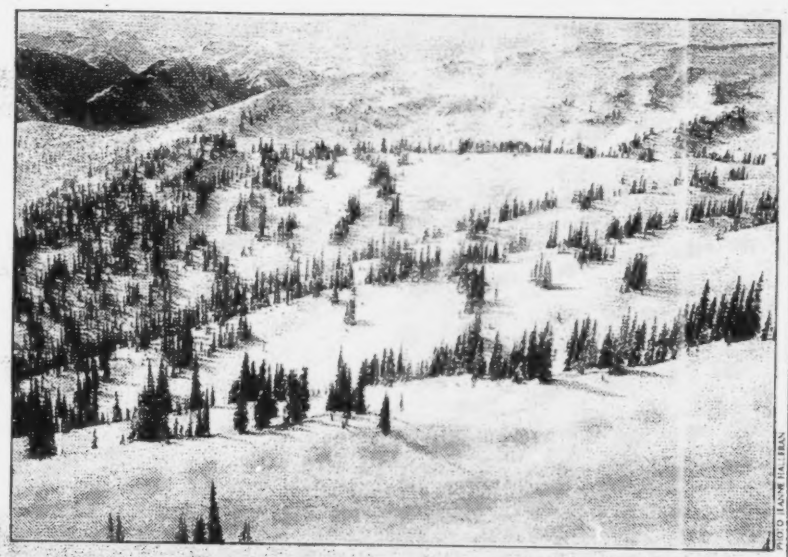

PHOTO: JASON HALLIDAY

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Biologist Ted Antifeau (top) monitors the habits of the North Thompson caribou as part of a study for both the Ministry of Forests and the environment ministry's Fish and Wildlife Branch. Similar studies of the caribou herd (above) of the Selkirk Mountains in southeastern B.C. reveal that the very survival of this tiny band is in doubt.

generally run out at an elevation of 1400 metres, the higher-elevation caribou habitat will not be logged as it is in the North Thompson.

In the Selkirk Mountains, the tiny caribou herd that ranges between Canada and the United States has attracted world-wide interest. The Ministry of Forests and the Fish and Wildlife Branch together have established management guidelines to keep the caribou in existence. But there are only 25 to 30 in the herd, and some managers feel they can be easily wiped out. This creates even more pressure to maintain caribou in other B.C. forests. As Fish and Wildlife Branch ungulate manager Macgregor points out: "If we can manage to keep up the numbers of forest-adapted caribou in other areas, like Wells Gray, we might be able to successfully transplant some to the Selkirks and keep that herd going." But given the range of difficulties faced by this herd, its survival is still very much in question.

Central to the Selkirk and North Thompson caribou-logging conflicts are the problems of forest resource commitments; caribou management is just one of a number of claims on an already dwindling forest land base. Major trade-offs in resource management will have to be made, and neither foresters nor caribou managers will be able to meet all of their objectives. But who is to decide how far each must bend? No logger and no forester wants to see caribou driven to extinction. Says Weyerhaeuser's Tolnai: "If an area is really necessary for the caribou, then a sacrifice simply has to be made. My point is that everyone should understand what the price of that is. If there has to be a social or political decision, the people should know what they are paying."

That is the object of the joint report the Ministry of Forests and Fish and Wildlife Branch are currently preparing — to determine what caribou protection would cost the province in terms of timber production. Suggested compromises for the North Thompson conflict have been passed on to the Environment and Land Use Technical Committee, a group of deputy ministers representing nine different ministries. From there the problem will probably be recommended to the provincial cabinet for a political decision that is likely to have far-reaching effects. As Ray Addison of the Ministry of Forests' Strategic Studies Branch points out: "The North Thompson conflict is only one component of a larger issue that encompasses resource-use priorities generally throughout the province. It is a question of integrated management: not whether it will be practised, but rather, what the end result of the integrated program should be."

LETTERS

Why Is Hardwood Soft?

You say on page four of the Fall 1980 issue of ForesTalk: "The term 'hardwood' applies to all deciduous trees found in B.C. The major species are red alder, western white birch, broadleaf maple, trembling aspen, cottonwood and balsam poplar." Of all those mentioned, I would class the birch as the only true hardwood, and all the others as softwoods. Although alder, if cured for the proper length of time, could be classed as a hardwood. Arbutus would most certainly be a hardwood if not split when green. I hope you will be able to clear this matter up.

D.G.F. Barton
Victoria, B.C.

The informative article in the Fall 1980 issue about B.C.'s hardwoods left me with one question unanswered. I have long been puzzled by the use of the term "hardwood" and "softwood" to distinguish between deciduous and coniferous species. Some woods, such as maple and birch, are clearly hard, but others you mention do not seem to qualify. I have always understood that Douglas fir is far and away the strongest for structural purposes. The article itself speaks of "high-strength softwood pulp" as opposed to "lower-strength hardwood pulp." Hardwoods are said to be faster-growing and to have a high water content, which seems contradictory. The article hints at my question in pointing out that the typical reaction to the word "hardwood" is to think of mahogany, teak, ebony or oak. Could you please explain?

Gordon W. Stead
Vancouver, B.C.

No one seems to be sure of the origins of the terms "softwood" and "hardwood". One guess is that historically, the hardwoods of Europe were indeed hard woods, and that the term came into common use worldwide, even in places like B.C. where the softwoods are, in fact, the harder woods. And that's the whole problem: hardwoods are not necessarily hard woods; softwoods usually are not soft woods. The terms essentially are illogical.

The term "hardwoods" designates broadleaved trees belonging to the angiosperm botanical family group. They are distinguished from softwoods by the presence of vessels, or pores, in their wood. Softwoods are nonporous, cone-bearing trees of the gymnosperm family. All B.C. softwoods are conifers (so-called "evergreens"), including the exceptional larch, which sheds its needles annually. The hardwood oddity in B.C. is the deciduous arbutus, which retains some of its broad leaves over more than one growing season.

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More Cross Words

As a reader who never received a ForesTalk readership questionnaire, I was very disappointed in finding the ForesTalk Crossword missing from the magazine. I found it a very interesting way of learning more about our forests. Hope we can again have it in your magazine, as I found it one of the most interesting parts.

Arnold Noble
Creston, B.C.

Please include my name with those of your readers who would like the ForesTalk Crossword reintroduced — I miss it.

Pat Davidson
White Rock, B.C.

ForesTalk is an outstanding magazine in every way. Please reintroduce the Crossword.

Mrs. J. Verkerk
Surrey, B.C.

I very much appreciate ForesTalk Resource Magazine, but wish you would continue carrying the ForesTalk Crossword. It was an exercise in acquiring knowledge with pleasure, and a bit of a challenge.

M. Hutchison
Haney, B.C.

I have read and enjoyed ForesTalk since the early days of its publication, and am very pleased with the increased variety of subjects it now covers. Regarding the ForesTalk Crossword, I miss it and hope it returns.

H. Goad
Parksville, B.C.

Keep the ForesTalk Crossword puzzle in.

Mrs. F.E. Derksen
Abbotsford, B.C.

I really did enjoy doing the ForesTalk Crosswords. They were educational too. Please do include them again.

Eileen M. Brookbank
Nanoose Bay, B.C.

Following the results of a readership survey carried out over a year ago, ForesTalk discontinued running the ForesTalk Crossword. But the letters keep coming in, requesting that the word puzzle be reintroduced. Please write us if you would like to see the return of the ForesTalk Crossword.

Letters to the editor provide an opportunity for our readers to discuss topics arising out of ForesTalk. Letters for publication must carry the sender's name and address. Views published are not necessarily endorsed editorially. ForesTalk reserves the right to edit for publication.

Bruce Fraser

by Peter Grant

Over the past decade the Ministry of Forests has had its hands full trying to accommodate B.C.'s increasing numbers of forest users. One method used to sort out resource-use demands in specific areas has been direct involvement of the public in the land-use planning process. This has proven so successful that a little over a year ago the Ministry of Forests "borrowed" Dr. Bruce Fraser from the education ministry to set up a full-scale Ministry of Forests public involvement program.

Bruce Fraser grew up in so many different B.C. towns that the list looks like a map index. He took his Ph.D. in ecology under University of British Columbia's eminent ecologist Vladimir Krajina, and has had a varied career that includes being an environmental activist as well as a community college principal. He is perhaps best known for his role in setting up one of B.C.'s first local advisory committees on resource use. The result was a co-operatively-planned logging operation in the Blewett community watershed in the West Kootenay.

While talking optimistically about public involvement in forestland management, Fraser says bluntly that no public participation program will work unless it "meets the needs of the people," and unless the public remains vigilant.

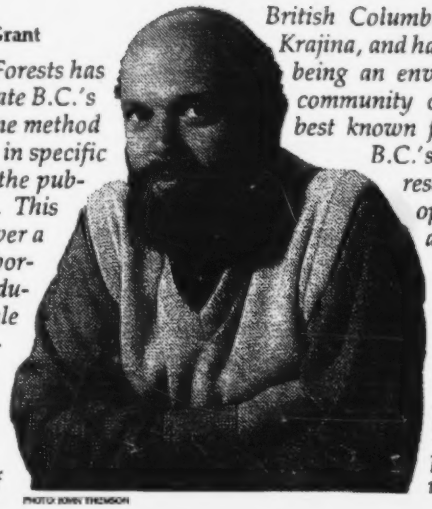


PHOTO: JOHN THOMSON

FORESTALK: What does "public involvement" in Ministry of Forests planning really mean? Is it essentially a matter of setting up local committees to advise on logging plans?

FRASER: Public involvement often means setting up committees, but that is just one method among many that the government can use to communicate with the public. You can have anything from a simple press release to a planning group that lasts 18 months.

FORESTALK: Why bother?

FRASER: Everyone has a formal democratic opportunity to become involved in what the government is doing: through elections, contact with M.L.A.s or M.P.s, or through organized groups or political lobbies. But once your advice has gone from the political level through the legislature, it has to be translated into regulations which are administered by a government department, and that department's practices finally have an impact at the local level. That's a long chain. We're trying to make a loop of it by giving people a chance to talk directly to a government department at the operating level — not just at the political policy-setting level.

FORESTALK: How do you do this in practice?

FRASER: My job here is to assist people in the Ministry to set up public involvement processes. It isn't a simple matter. For one thing, the issues are technically difficult. For a second, the human relations aspects of getting people to work together are difficult. So we have to take a professional approach to training Ministry staff in the methods of public participation — just as we do in the methods of forest management. The first steps in that direction have been the development of a handbook and slide-tape presentation.

FORESTALK: Why can't forest managers simply apply public involvement methods that have worked well in other places?

"Many people suspect that any large government agency wants to appease public opinion so it can then carry on without obstacles."

FRASER: We say to forest managers in the field: "You have to prepare an intelligent public involvement program that relates to the circumstances you find yourself in. You can't just take a nice public involvement method off the shelf and expect it to work." If there is one thing I've learned from managing institutions and from working with human relations groups it is that it is absolutely essential to get people's willing participation. They have to feel they own the program.

FORESTALK: Give us an idea of the different approaches to involving the public in Ministry of Forests planning.

FRASER: One example is the public advisory committee set up to comment fairly informally on behalf of the people of Nelson about the possible effects of logging and road-building on their community watershed. By contrast, the South Moresby Resource Planning Team in the Queen Charlottes has an extremely formal mandate to come up with recommendations about major land-use decisions that include not only forests, but also parks, historical values, anthropological values and Haida Indian interests.

FORESTALK: It sounds like the more far-reaching decisions require a more formal committee structure.

FRASER: That's right. And the process goes through a number of stages. Take the mountain pine beetle problem in the East Kootenay, an enormous problem that affects some 20 drainages from the border to Golden. The public involvement program there started with a public field trip, and followed up with a one-day public workshop to make people generally aware of what is going on. It will now move on to setting up detailed watershed planning committees. Each committee will be different because the circumstances in each watershed are different. One watershed may represent a potential wilderness area, another an area where new roads might create improper visual effects next to a ski slope.

FORESTALK: Is this kind of public involvement really new?

FRASER: The Ministry of Forests has been involved with the public ever since the first ranger station went up. That hasn't changed — the district offices still play a major role in dealing with the public. But today we're not just talking in

terms of burning permits and where you can cut firewood. Today it is necessary to negotiate major accommodations among agriculture, forestry, wildlife, water and all the other resources. And it's not easy to make decisions because there are very strong reasons for supporting each competing resource. Tough compromises need to be hammered out; that requires more systematic communication methods.

FORESTALK: What's the public's attitude to this program?

FRASER: Many people suspect that any large government agency wants to appease public opinion so it can then carry on without obstacles. That's a valid concern. Within the Ministry we've been trying to make sure that the methods of public participation we use are real, that they have a true impact on resource-use decision-making.

FORESTALK: How do you convince people of that?

FRASER: You only convince people of that by following through; by producing results.

FORESTALK: Can you give some examples of where public input produced results?

FRASER: An East Kootenay public advisory committee came up with recommendations on logging, wildlife habitat and wilderness preservation for the Middle White River drainage. Most of these have been put into place by the Ministry. A similar advisory group for the Creston area made a number of forest management recommendations, including the protection of the Arrow Creek watershed serving Creston, which the Ministry subsequently implemented.

Another example is Coordinated Resource Management Planning, where forestry, wildlife and ranching interests have collaborated extensively. There are lots of results from that (see ForesTalk Fall 1980). In many other cases the planning processes are quite young and haven't come to a conclusion yet.

FORESTALK: We understand that at least one member of the public advisory group in the Smithers area feels that no committee recommendations of any real significance were ever acted on by the Ministry. What does a committee's recommendations count for in a case like that?

FRASER: The setting up of a public advisory committee doesn't automatically mean the Ministry will implement its recommendations. It could be that the cost of doing that is just too high; or the recommendations may run counter to broader government policy. Also, the Ministry is accountable for the long-term results of its resource-use decisions. Twenty-five years from now it won't be the committee on the carpet if a second growth forest doesn't measure up.

But if the Ministry of Forests can't accept a recommendation from a public advisory body, it is absolutely essential that it give its reasons why. And if the Ministry doesn't respond at all to a committee's recommendations, that's a major failing.

FORESTALK: What happens when you want to get the public involved and the public stays away in droves? We've heard that the public meetings about the Nelson watershed weren't very well attended. What does that indicate?

FRASER: A tactical error. The Ministry of Forests set up five or six separate public meetings; something like that gives the impression that the topic is not very urgent.

If your goal is to get serious public input, then you have to look at various methods and choose those that work, not just those that would be easy to run. If you end up with a small turnout, you say, "we didn't gather anyone by that method. What other method are we going to use? Will it take a house-to-house mailing, or exposure to local groups like the Rotary Club or a fish and game club?"

"We're talking about making decisions for use of the landscape that are going to persist for generations. We can't afford to make them in haste."

FORESTALK: What happens when the public isn't happy with the results of the decisions it helped develop?

FRASER: The planning group should be re-formed to consider the plan. That goes along with one of my biggest concerns, which is that we should monitor the results of decisions the public has been involved in making. I'm also hoping to see information-exchange networks develop between the 15 or so public participation groups now operating throughout the province. It's important for a person in Cranbrook, for example, to know how the South Moresby planning group is working out —whether the public involvement methods being used there are working.

FORESTALK: Today you talk in terms of a cooperative approach to resource planning, but we understand you were once more of an environmental activist.

FRASER: While teaching botany and biology at Selkirk College, I and some others started the then Kootenay Pollution Control Association. I was fairly noisy on environmental matters, including logging. I was part of the lobby for the Purcell Winderness Area.

FORESTALK: How has your public career evolved since then?

FRASER: I went through the stage of confrontation politics and didn't see a lot of progress out of that, other than general awareness. We had to go that next step of working for actual results, and cooperative methods seemed to be required.

FORESTALK: Do you find it difficult to convince Ministry of Forests staff of the merits of public involvement, especially if they aren't used to working with the public?

FRASER: You have to be careful about applying a stereotype to the Ministry staff. Their attitudes vary all over the map, and with all ages. Some of the people who came up through the old ranger staff have very good relations with the public; they have some of the most enlightened attitudes about the need for public input into forestland planning. On the other hand, some recent technical college or university graduates can be as backward in their thinking on this topic as anyone can.

FORESTALK: Isn't there a danger of losing the momentum of the public involvement concept by formally organizing it?

FRASER: We're talking about making decisions for use of the landscape that are going to persist for generations. We can't afford to make them in haste. If the public involvement program is going to result in sensible decisions, it can't just be something that's announced today as policy and put into practice tomorrow. The process has to be well thought out. Committee members may need training in some methods of resource analysis; they might need months to look carefully at the implications of resource trade-offs they may be contemplating. All that takes time, and a lot of skill and organization.

FORESTALK: How quickly is the public involvement "message" getting around the province?

FRASER: Last fall we ran our first workshop for people from the Ministry, the forest industry, other resource agencies and members of public groups. About 130 people discussed our public involvement methods and the resources issues we are solving — or not solving — by using them.

The whole idea is to get these people talking to each other; then the public involvement process should evolve very quickly throughout B.C. If we build up the process in each region, using local people's knowledge and practical expertise, we will get something that will work.

WRITING THE RECIPES FOR FUTURE FORESTS

by **Gord Price**

ILLUSTRATION: KEN SEABROOK

It's a package deal. The vegetation is a reflection of the climate, the soils, and the terrain. If you know the plants, you know a lot about the other parts of the ecosystem – just what's needed to make sound reforestation decisions.

Let's play forester. Here's your first problem: You are faced with a clearcut from a recent logging show; the leftover slash was subsequently burned. What do you do?

— Do you let nature regenerate the site naturally? (If the species that grew there previously thrived in a shaded environment, will new seedlings be able to survive direct sunlight?)

— Do you plant the same tree species that was cut down? (If drainage patterns have changed, will the seedlings survive a wetter environment?)

— Would one species of tree be the best choice for replanting the whole site, from valley bottom to ridge top, or would a mix of species be best? Or do you simply plant the species that is worth the most on today's lumber market?

Obviously there are no simple reforestation answers, partly because the questions have become so much more complex.

The first tree planting programs in British Columbia took place on low-elevation sites on Vancouver Island and the lower mainland — just about the best Douglas fir territory in the world — so that's what was replanted. Around the beginning of the 1960s logging had moved to higher elevations, and although Douglas fir didn't grow so well there, it was often planted on these sites simply because it was the most valuable tree on the market. But five or six years later foresters began to notice that Douglas fir seedlings didn't always fare so well on those high-elevation sites; other tree species would have to be planted there instead. But how to go about deciding which ones? Tradition alone wasn't providing the answer.

Fortunately, at about the same time a method for making these kinds of silvicultural decisions was being developed at the University of British Columbia. It works on the principle of ecosystem classification — a remarkably simple idea.

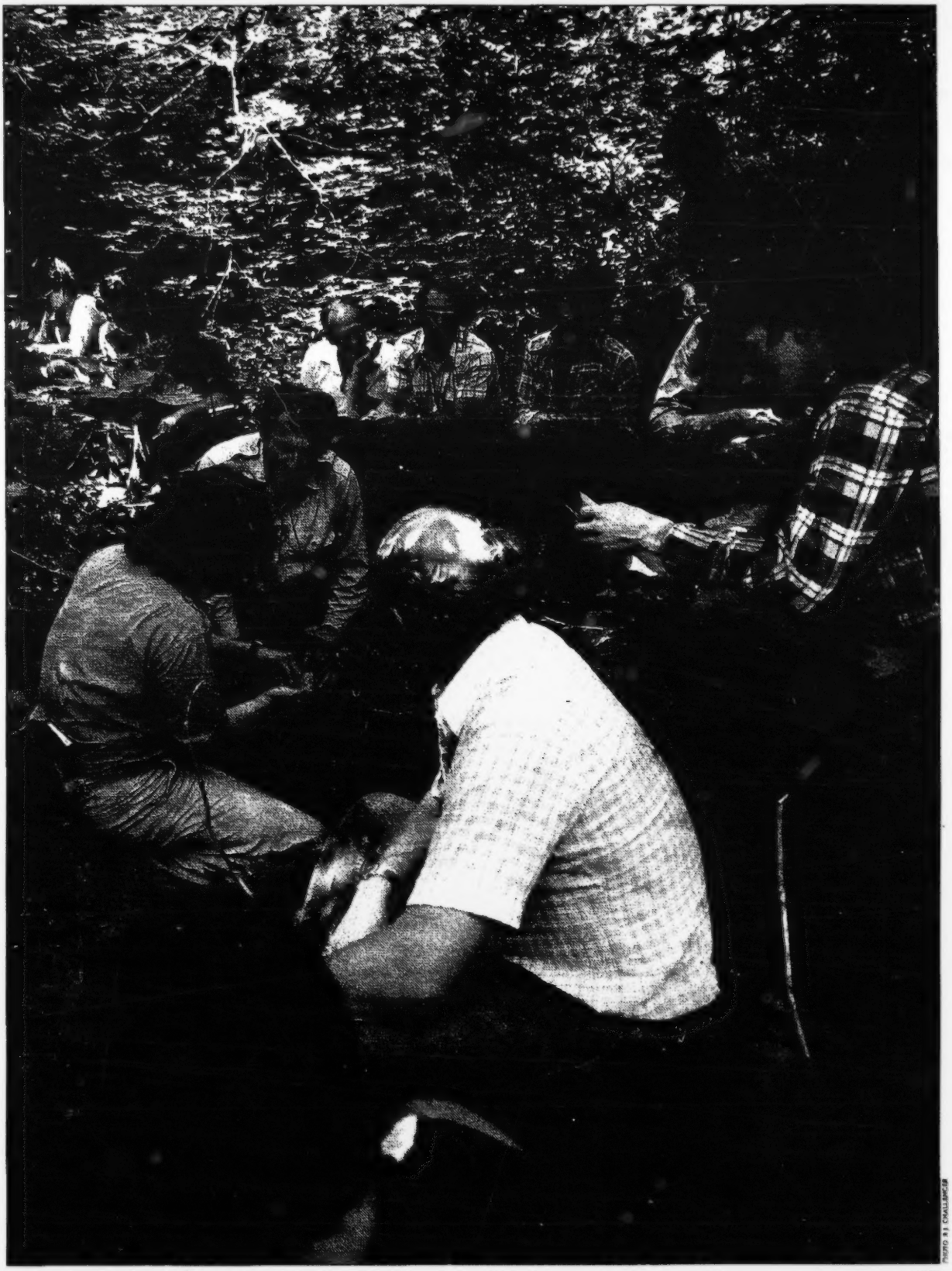


PHOTO BY CHALLENGER

In the past half-dozen years the study and application of forest ecology has come into its own in B.C. Using a method known as ecosystem classification, foresters gain important information about the province's many and varied forest ecosystems by studying forest plant life such as red mountain heather (bottom), or moss on a hillside (below).

An understanding of the interrelationships of plant life, soils and climate helps forest managers make better forest management decisions. This knowledge is best acquired first hand, and Karel Klinka (previous page, centre) of the forests ministry's Vancouver Forest Region Ecology Group is an enthusiastic guide of forest ecology field trips.

Ecosystem classification confirms a well-known generalization about the environment: each thing is connected to everything else. Forests, for instance, are more than timber stands; they are ecosystems — complexes of living organisms interacting with their environment. If you have information on some parts of the system, you can predict with some accuracy how the other parts work.

If a particular plant is in abundance — say, foamflower — it's a good bet that the surrounding trees will be thriving Douglas fir. Along the coast, dark and damp mineral soil is likely a very good site for western red cedar.

The idea is only common sense — making sense of nature by understanding what is common in its workings. To decide which species of trees to plant in a given location requires an understanding of that location's climate, soils, terrain and, in particular, an understanding of the associated understorey vegetation. But the particular intricacies of even one ecosystem are probably beyond human understanding; the number of interacting organisms is virtually incalculable. What can be done is to organize the available knowledge of ecosystems into a logical and practical format.

Although several studies had been done on the topic as far back as the 1930s, the first man to undertake the task of producing a comprehensive ecosystem classification system for British Columbia was Vladimir Krajina, a political refugee from Czechoslovakia who fled to Canada in 1949 and gained a post at the University of British Columbia as a plant ecologist. Accustomed to the intensive forestry practices of Europe, he was an outspoken critic of forest abuses in British Columbia, particularly of the automatic and indiscriminate use of slash burning and of the province's underdeveloped silvicultural methods.

In the U.B.C. botany department Krajina achieved recognition for his studies on the ecology of forest trees and for his work on ecosystem classification. By emphasizing the impact of climate on the province's varied ecosystems, he was able to classify the province into a number of distinct zones, each characterized by a dominant climax tree species. (A climax species is one that continues to renew

Getting Rid Of The Guesswork

How is ecosystem classification actually applied by foresters in the field? To find out, ForesTalk asked Karel Klinka, a forester specializing in ecology and soil science with the Vancouver Forest Region Ecology Group, to show us how it's done. The site chosen for the demonstration was one of B.C.'s better-known ecosystems — Stanley Park.

About 75 metres past the west end of Stanley Park's Beaver Lake, Klinka chooses a small, triangular opening across a rushing stream. He points out that the clearing is the result of recent disturbance. "Come back next summer, and the salmonberry will be impenetrable."

The first step in classifying a forest ecosystem is to observe the nearby trees. "Western hemlock," notes Klinka. "The trees are probably 60 to 70 years old and came in after the old growth Douglas fir was logged. It's the climax species. Few other tree species are going to grow naturally here."

He walks around the clearing, pausing occasionally to stoop down and pluck a plant here, an herb there, finally returning with a bouquet of what he calls plant indicator species. He names each plant in turn and explains what they

tell him about the soil. "This lady fern is a reliable indicator of high nutrient and moisture levels in the soil. And salmonberry also thrives best on nutritionally rich and very moist sites. But it is intolerant of shade and needs open space. The horsetail here prefers constantly wetter sites, telling us that the water table is near the surface."

The next step is to dig a small soil pit about half a metre wide and deep. The mineral soil is dark brown; the result of incorporating organic matter. "Lots of available nutrients," notes Klinka.

The pit is filling with water. "The seepage is moving towards Beaver Lake at about the 30-centimetre level," he observes, "enriching the site with outside nutrients. If the water table were any higher, or the seepage water moving any slower, we'd have skunk cabbage growing here." Both the soil pit and the indicator plant species have been telling the same story.

Now comes the most interesting part. Using the information he has just gathered, what species would Klinka suggest be planted here if it were a logging site rather than a park?

"Well," if the site was left to regenerate naturally after logging, the salmonberry would come in right away. Red alder could get established and shade out the salmonberry. In another 20 to 30 years, the hemlock would start to come back in.

"Because the site is so rich, western red cedar would grow fast here, so I'd plant big-stock cedar, maybe a metre high to get it started growing above the salmonberry, and with maybe a minor amount of Sitka spruce and grand fir. In about a hundred years you'd get dimension lumber or timber for shakes.

"The site is too wet for Douglas fir. Foresters have learned from mistakes that Douglas fir dies on very wet sites, or on sites where the salmonberry shades it out."

How would he harvest the area?

"Since the seepage water is moving relatively fast, clearcutting would not create a swamp. A medium-sized clearcut, with yarding during the dry season by cable settings, would be preferable. Afterwards, I would broadcast burn. That would delay the brush from coming in and avoid the use of herbicides. There's no fear of nutrient or mineral loss, and erosion is not a problem since the land is flat."

The whole procedure has been fast and efficient, typical of the kind of activity that is becoming the norm province-wide where reforestation decisions are being made. ☐

itself so long as its habitat is left undisturbed. On the east coast of Vancouver Island, for instance, the climax species is Douglas fir, hence the coastal Douglas fir zone. The west coast of the island is covered largely by the coastal western hemlock zone.

Unfortunately, Krajina's pioneering work was largely ignored at the time by foresters unable to foresee its practical applications. Krajina retired from teaching in the early 1970s, but even today he continues to work on his research.

One person who did realize early the importance of studying how the land base affects forest management was George Warnock, the Ministry of Forests' Research Branch Director of the day. By 1975 he was able to hire two pedologists (soil scientists), two of whom were former students of Krajina. They were sent to the province's various forest regions and assigned the task of completing a land classification system for forest and range management — a big step for a Ministry which up to then had been concerned primarily with timber harvesting and forest fire protection.

For the first year the pedologists familiarized themselves with their regions. They collected plants and examined soils, they tried out various classification methods to suit their own needs, moreover, they used an integrated approach. In some cases, such as the Skeena pilot project, researchers from different disciplines (especially soils and plants) worked together as a team.

This gathering of knowledge about ecosystem classification coincided with other similar trends. University professors such as J.P. Kimmins were spreading the concepts of ecology, foresters in general were asking for more ecological information, forest companies were even drawing their own biogeoclimatic maps. People in general were becoming aware that the

The presence of Siberian miner's lettuce (above) is one good indication that the surrounding area is a productive ecosystem for the growth of Douglas fir. Before finally deciding which tree species would grow best on that site, however, a forester would first identify a number of shrubs, herbs and mosses, as well as take a good look at the soil.

forest is a finite resource, and that the loss of a good forest site to brush, or the destruction of valuable soil because of an unwise burn, are costs to be paid. The study of the ecology of forest trees in British Columbia was coming into its own.

Through 1976 and 1977 the Research Branch coordinated the work the pedologists were doing in the regions. Krajina had established the basic ecosystem classification framework used by the field workers; what the researchers were coming up with was a detailed ecosystem classification system for each of their own areas. This would, in turn, provide forest managers with the required information to make sound silvicultural decisions on-site. The key was nature's own plant and soil indicators.

This "site-specific" approach to forest management was quickly adopted throughout the province. Where once researchers had to scrounge for funds and helicopter time, they were now being asked by regional managers to compile manuals, train staff, write background papers and draw detailed technical maps. One researcher sums up the change in attitude: "Foresters used to call us flower children. Now they're pressing leaves and flowers in their own manuals."

Today each of the province's six forest regions has researchers and forestry crews working on the classification of ecosystems. The Vancouver Forest Region has already completed a series of ecological studies, among them a guide that forest managers can use when selecting tree species for planting. Draft copies of working manuals for the identification and interpretation of forest ecosystems are ready in the Nelson, Kamloops and Cariboo Forest Regions. Other forest regions are still compiling basic information on vegetation, soils and ecological relationships.

The use of ecological classification soon will be expanded to other areas. Work currently is underway to provide ecological guidelines for such things as selecting the appropriate number of trees to be planted per hectare, for fertilization requirements, and for preparing logged-over sites for successful reforestation and more productive growth. In addition, the Parks Branch is testing the system in certain heavily-used areas.

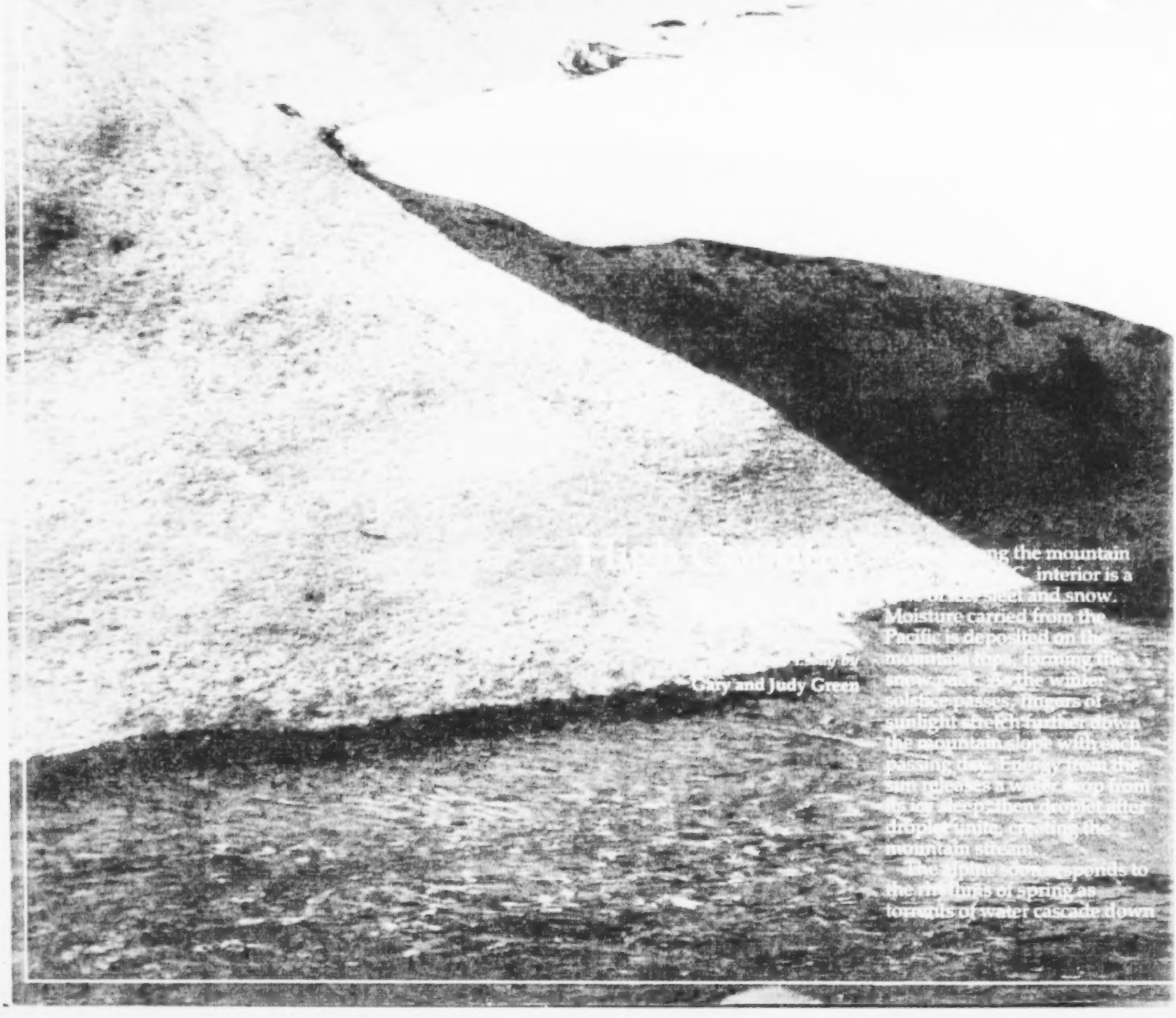
And what of the future? "While there are still a lot of unanswered questions," says Dick Annas, researcher in charge of coordinating ecosystem classification for the Ministry of Forests, "we can see the possibility of a computerized information system and more effective data collection — all coordinated with inventory procedures."

If Annas is right, the forester of the future may drive to the woods with a computer terminal mounted on the dash of his pick-up, much like that in a police car. On arrival at a site, he punches in a few coordinates and the screen lights up with the history of the area: original species, cutting date, volumes harvested, species selected for reforestation, silvicultural treatments, and even the recommended age for thinning and harvesting.

Or perhaps he arrives at a stand scheduled for logging. He feeds the computer information on climate, vegetation, soil types, slope and drainage, wildlife and fisheries habitat, recreation use, and even milling requirements. The computer then provides him with advice on a recommended harvesting schedule, on species suitable for reforestation and on future silvicultural treatments.

All of that information and advice would be the direct or indirect result of research being carried out today. With ecosystem classification, practical ecology has been taken to the roots of forestry. ✪

Throughout the province there are more than 70 Ministry of Forests personnel working directly on ecosystem classification programs. This work, which was pioneered by U.B.C. ecologist Vladimir Krajina, is based on the division of the province into a number of biogeoclimatic zones (map above). These zones and their many subzones are distinct ecosystems, each a different inter-relationship of plants, soils and climate. The ecosystem on page 16 (opposite), for example, is known technically as a sword fern association and is a productive site for the growth of Douglas fir.



Gary and Judy Green

ng the mountain
interior is a
and snow.
Moisture carried from the
Pacific is deposited on the
mountain
sunlight
the mountain
mountain stream
the
to the
torrents of water cascade down

rock faces. Over the centuries, the spring run-off has etched, scoured, carved and polished the mountain face. Rock slides near the stream are alive with the scurry of pikas darting from rock to rock. These mountain hay-makers squeak their song of joy at the arrival of spring; a grizzly ambles down the bank to quench his thirst.

Leaving the alpine, the stream tumbles into the tree line. Here it bubbles through forests of sub-alpine fir and Engelmann spruce. Near this stream a male blue grouse hoots his call of love to any receptive female; a porcupine waddles for the protection of a spruce tree.

The many spring streams collect in geological pockets in the higher regions of the mountain slopes. The still waters of these sub-alpine lakes reflect the conical shapes of the fir trees, an image broken only by the ripples of [illegible]. Shoreline trails are mute evidence of a passing herd of mountain caribou. These [illegible] of the hills leave the [illegible] over during the early morning hours to drink from the sub-alpine lake. During the harsh winter months, beard lichens draped on the branches of mature trees formed these animals' staple diet.

Mountain run-offs and alpine lakes create the watersheds of the many river systems which feed the valley bottoms during the dry season. This is the forest's method of water conservation.

High country run-off establishes the living artery — the mountain stream — for an entire forest ecosystem.

COLLECTIONS

Do you know any interesting facts about forests? Mail submissions to: ForesTalk — Collections, Information Services Branch, Ministry of Forests, 1450 Government St., Victoria, B.C. V8W 3E7. Information should be brief, accurate, and sources included where possible.

The Nootka Whaling Harpoon

PHOTO: R.I. CHALLENGER

The Indians of the Pacific coast made their living mostly from the products of the sea, but the tools and weapons they used were fashioned from the products of the forest.

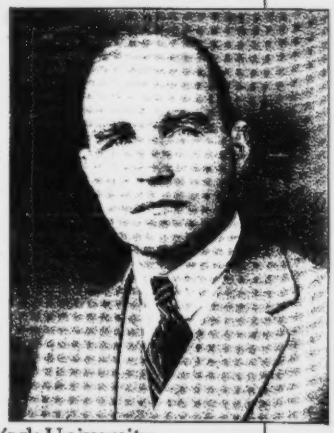
The Nootka Indians on the west coast of Vancouver Island and the Olympic peninsula were the only group of Pacific Northwest Indians to hunt whales. To do this they developed a distinctive and effective whaling harpoon, using their thorough knowledge of the special properties of each of the trees of the rainforest.

Because the harpoon shaft had to withstand being thrust with all of a man's power into the side of a great grey whale, the Nootka made the harpoon shaft out of yew wood, unequalled for strength and resilience.

The harpoon head consisted of a sharpened mussel shell at the point, with barbs of antler or bone which the Nootka bound together with bark from the wild cherry bush. This bark is an exceptionally tough material that conveniently unwinds from the trunk in strips, like string from a ball. The entire head was then coated with pitch from the shore pine, or gum from the Sitka spruce. These acted both as a glue and as a wax to help the harpoon head glide through the water.

A harpooned whale was kept tethered by means of a lanyard attached to the harpoon head. The lanyard was made of slender cedar branches braided together, sometimes reinforced with gut or sinew. It was tough and flexible enough to hold the thrashing and diving giant for a full day and night — or more — until the weary hunters could finally tow it ashore.

HARVEY REGINALD MACMILLAN (1885–1976) CHIEF FORESTER (1912–1916)



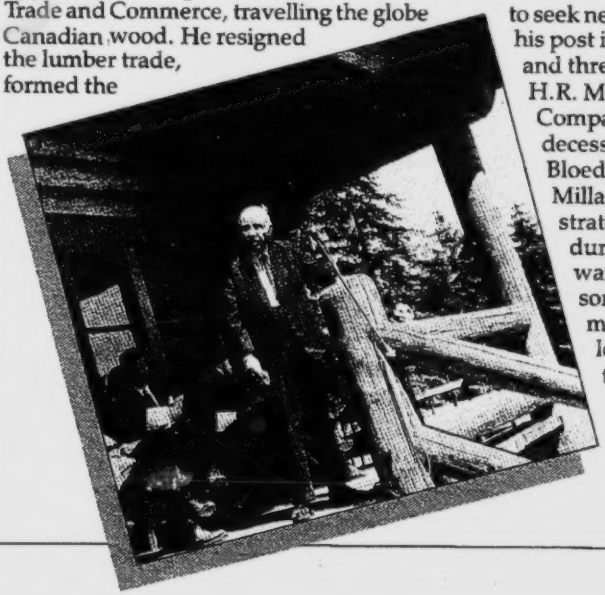
Following his address to the 1915 annual meeting of the national Commission of Conservation in Ottawa, H.R. MacMillan was congratulated for giving such a forthright delivery. A senator who was present ventured the opinion that the young Chief Forester from British Columbia had the potential to become Canada's Prime Minister, should he ever decide to enter politics. As it turned out, the task of organizing the B.C. Forest Branch was enough to keep "H.R." well occupied.

A native of Ontario, MacMillan graduated from the Ontario Agricultural College and proceeded to York University, receiving his Master of Forestry degree there in 1908. The next four years were spent with the Forestry Branch of the federal Department of the Interior, surveying Canada's forest resources and collecting statistics on lumber production.

In 1910, the report of the first B.C. Royal Commission on Forestry recommended that legislation be enacted to provide for the establishment of a government service to manage British Columbia's forests. In addition, the commissioners suggested that ". . . the province should spare no pains in searching the continent for a man of exceptional ability . . ." to assume the task of directing the new agency.

Of the Canadians with university training in forestry, lands minister William R. Ross picked H.R. MacMillan to be B.C.'s first Chief Forester in 1912. (MacMillan was recommended for the post by his former professor at Yale, Henry S. Graves, who had since become Chief of the United States Forest Service.) MacMillan immediately set about forming the new government service by recruiting foresters and other personnel. Within a year's time, roughly one-third of the university trained foresters in Canada were employed by the B.C. Forest Branch.

In his last 15 months as Chief Forester, MacMillan held an additional appointment as Special Trade Commissioner for the federal Department of Trade and Commerce, travelling the globe to seek new markets for Canadian wood. He resigned his post in 1916 to work in the lumber trade, and three years later he formed the H.R. MacMillan Export Company, the predecessor of MacMillan Bloedel. H.R. MacMillan went on to hold strategic positions during both world wars, and his personal accomplishments made him a legend in his own time.



THE ORIGINAL TREE BREEDERS

The first people to practise selective plant breeding may have been the American Indians of Mexico and New Mexico. As many as 9000 years ago, according to modern radiation dating, the Indians discovered that planting the seeds of only the best-looking ears of corn meant a better crop the following year. The plants would be more abundant or the ears bigger and better-tasting. The Chinese made the same discovery with rice, as did the settlers of the Tigris-Euphrates valley with wheat and barley. Through the ages the art of selective breeding has developed better cattle and other domestic animals, as well as any number of improved vegetables and fruits. Timber, on the other hand, escaped manipulation by man (probably because of the once ample global wood supply) until the 18th century.

In 1737 John Menzies packed several European larch seedlings in his bags for a trip to Scotland; these ultimately would become the basis for an historic tree-planting project on the Duke of Atholl's estate in Dunkeld, Scotland. While tree planting had become popular in English country estates a century earlier, this larch project was probably the world's first experiment in selective tree breeding.

For more than a hundred years the nursery at Dunkeld grew larch seedlings for the estate — more than 15 million seedlings in all. The Dunkeld gardeners always sought out the tallest and best-formed larches from the forests and used the seeds from these superior trees to grow new trees. The young trees normally had the same superior traits. Meanwhile the workers thinned the older stands, removing slow-growing trees and those with crooked stems. In time the entire forest of 10,000 acres was a pure strain of European larch.

Tree breeding today is a much more scientific pursuit. In hundreds of projects around the world, including those of the Ministry of Forests' research branch, tree breeders are using the now-known laws of genetics to create tomorrow's "super" trees. They cross-breed different races, even mix different species, with surprising results. And much of the credit for getting all this started has to go to John Menzies and his larches.

MAYPOLE: Relic of Woodlore

Woodlore, the branch of folklore concerned with the magic of trees and forests, has all but vanished in the strong light of contemporary science. With it has disappeared a host of customs that centuries ago were part of every European villager's life.

Some schools still stage Maypole dances in the spring: Girls in pretty dresses dance in a circle holding streamers tied to the top of a pole, while a circle of boys moves in the opposite direction. This spring dance is the remnant of an ancient custom aimed at encouraging the growth of new crops. By bringing a living tree (usually an evergreen) into the fields or the marketplace, the villagers hoped to influence the spirit of vegetation. Fertility rites and dancing were a major part of this custom. These rituals were outlawed as urban "civilization" spread to the countryside, but the tradition of the live evergreen lived on in the form of a pole redecorated each spring with fresh flowers or boughs.

CORK OAK

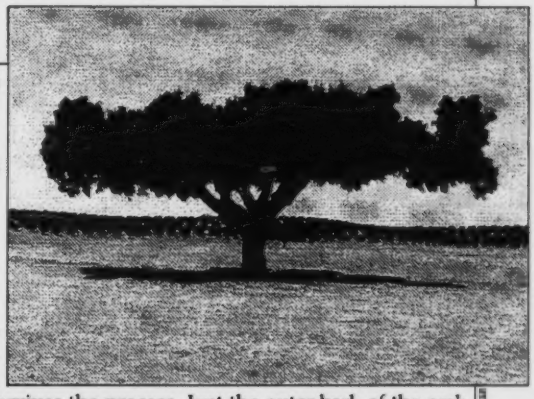


PHOTO: ED SADLER

This stately oak tree produces literally hundreds of materials for use in construction, insulation, interior design, sports equipment and bottling; and remarkably, it survives the process. Just the outer bark of the cork oak (*Quercus suber*) is harvested, and only once every nine or 10 years. A cork oak must reach an age of 20 years before its bark is first stripped, generally during the summer. After harvest, each tree trunk is marked with a large numeral to indicate the years when its bark was removed.

Cork plantations have been cultivated for centuries on the rolling plains of southern Europe and the North African coast. The ancient Greeks and Romans used cork for fishing floats and bottle stoppers, uses that are still prevalent today. In modern times cork has been applied to a nearly endless list of needs and products in manufacturing, building and technology. Cork is particularly valued in home design because it is attractive, pleasing to the touch, and a good thermal and sound insulator. It's also remarkably fire-retardant, and has been used as a thermal shield for aerospace missiles and rockets.

Most of the world's annual output of 390,000 tonnes of cork comes from the Iberian Peninsula; Portugal produces 51 per cent of this amount, and Spain 28 per cent.

THE EVERGREENING OF BRITAIN

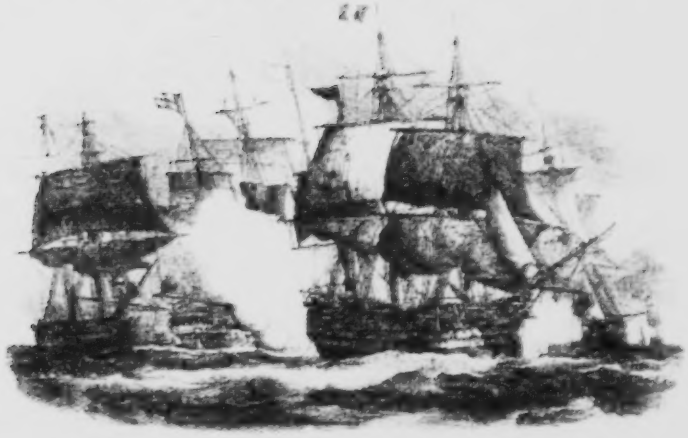
THE B.C. CONNECTION

by Graham Wallace

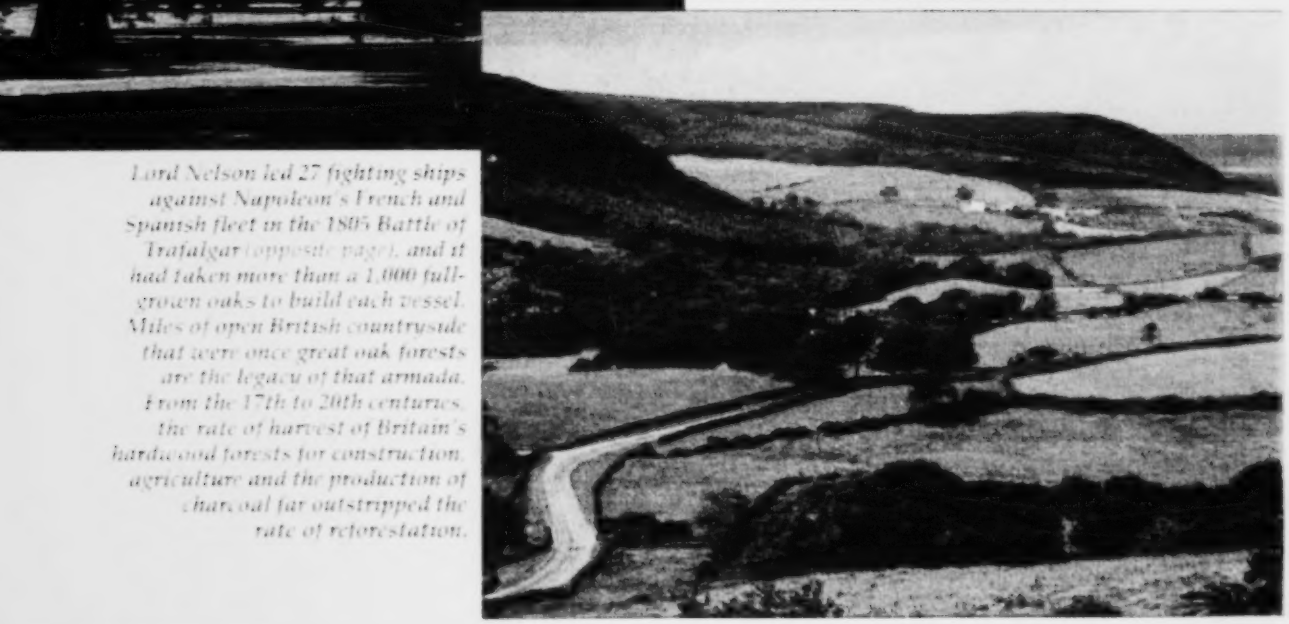
Great Britain was once the world's foremost imperial power, but today it is experiencing a taste of reverse colonization. Only in this case the colonists are trees from the rainforests of B.C.

During World War I, the efficient German blockade of the British Isles forced the British to rely on their meagre domestic timber supplies to provide the much needed pit props and shoring material for their coal mines — the country's main source of energy. About one ton of timber was used in the mines for every three tons of coal produced. By the end of the war Britain found itself faced with a serious shortage of home-grown timber.

This was not the first time the grip of war had perilously denuded the British countryside. When Elizabeth I built the empire's first navy, and again when Nelson assembled a fleet to meet the threat of Napoleon, the forests of Great Britain were sacrificed. It took more than 3000 full-grown oaks to build a single ship of the line, and miles of open British countryside that were once great oak forests are the legacy of that armada.



Following World War I, Britain faced a serious timber shortage. To remedy this, Parliament created a Forestry Commission in 1919 with the mandate to increase the country's domestic timber supply. This required – and still requires – considerable forestry research, and the Commonwealth Forestry Institute of Oxford University (below) houses more than 12,000 books on the subject.



Lord Nelson led 27 fighting ships against Napoleon's French and Spanish fleet in the 1805 Battle of Trafalgar (opposite page), and it had taken more than a 1,000 full-grown oaks to build each vessel. Miles of open British countryside that were once great oak forests are the legacy of that armada. From the 17th to 20th centuries, the rate of harvest of Britain's hardwood forests for construction, agriculture and the production of charcoal far outstripped the rate of reforestation.

(below) Forest Officer Jerry Haggett stands at the entrance to Thetford Forest in Norfolk. Established on land of little agricultural use, this was one of the Forestry Commission's first afforestation projects. The trees of Thetford Forest are mostly Scots pine and Corsican pine, although much of Britain's new forests are B.C. Sitka spruce and lodgepole pine. The Forestry Commission and private landowners together are planting about 20,000 hectares of new forest. 80 per cent of this planting takes place in the soggy soil of Scotland. With the help of deep drainage channels ploughed into the peat (bottom, opposite page top), land that was virtually unuseable is being transformed into lodgepole pine and Sitka spruce plantations.

This extreme reliance on trees had made Britons conscious of the limits of their timber resources, and by Nelson's time the fundamental concepts of silviculture were well understood. The 17th and 18th centuries are often referred to as the era of the great plantation movement, as certain landowners embarked on extensive tree-planting programs. The 19th century saw botanists such as the Scottish David Douglas (from whom the Douglas fir gets its name) dispatched to travel the world to send back specimens of trees and plants for use in British gardens and arboreta. The moist climate of the Pacific northwest eventually provided Britain with a wide range of exotic flora. Despite this considerable silvicultural awareness, however, the rate of reforestation in Britain did not keep pace with the rate of woodland clearance for agriculture, construction, and the production of charcoal for iron smelting.

The events of World War I clearly drove home the point that Britain had to do something about its dwindling domestic timber resource, and government leaders pledged that Britain would never again find itself without a healthy reserve of forests and wood. It was a pledge that would not only affect forestry in that country for decades to come, but directly involve British Columbia as well.

The first step was for parliament to create the Forestry Commission of Great Britain in 1919. The Commission's original mandate was to establish 80,000 hectares (200,000 acres) of new forest in the following 10 years, and 708,000 hectares (1,770,000 acres) by the year 2000. Following World War II, a more ambitious government forest policy advocated the creation of two million hectares of productive woodlands in Great Britain between 1947 and 1986. With less than 20 years to go, the total area of new forests is today well over the 1.6 million hectare mark.

Since all land capable of growing trees was in private hands, to fulfil its mandate the Forestry Commission set about coaxing private landowners to turn land which had not nurtured a sapling in centuries into tree plantations. The Commission was armed with strong legislation, but preferred instead to rely on modest grants and persuasion to enlist the support of landowners. At the same time, the Commission embarked on a program of buying poor-quality land on which it established new tree plantations. Today slightly over half of the more than 1.6 million hectares of new forests in Britain are under government management, with the remainder in private hands.

For the most part, the tree species being planted by the Forestry Commission and private landowners weren't – and aren't – England's traditional oak, beech and ash. Instead, Sitka spruce and lodgepole pine from B.C. cover much of the reforested areas. These B.C. softwoods dominate Britain's reforestation program, not just because they adapt well to the island's climate and soils, but because conifers are commercially preferable to the broadleaved species. Traditionally, English hardwoods found their major markets in fences, fuelwoods, furniture, flooring and as shoring in the coal mines. Today, they are used mainly as small mining timbers and for pallets and packaging. Softwoods, on the other hand, can be used for lumber, pulp and paper, and any number of related uses. Also, conifers in Britain reach a harvestable size much more quickly than do hardwoods.

For generations, however, British landscape artists such as Constable and Gainsborough featured a centerpiece grove of oaks, elms, or beeches in their work. Landscape architects continued to plant decorative hardwoods to provide a landscape setting for the great houses of the aristocracy. These sturdy hardwoods are seen as symbols of the British character, but once the Forestry Commission had set to work reforesting the country more and more landscapes highlighted evergreens from the distant shores of British Columbia. In fact, reverse colonization of the forest landscape had proceeded so efficiently that by the 1960s certain segments of the British population had become deeply concerned, fearing that practically every hardwood in Great Britain was in danger of being replaced by a commercially preferable conifer.

Various forms of public protest were mounted against the evergreening of Britain, and ultimately the Forestry Commission made significant modifications to its reforestation program. The immigrant conifers would continue to be planted in the rocky and peat-bogged highlands and moors of Scotland, Wales, and the

north of England, hardwoods would be planted on an increasing scale in the south of England. In these overpopulated lowlands, the home of native hardwood stands and grand Royal forests, the style of forests being developed would be strongly influenced by tradition, aesthetics and outdoor recreational values — not just economics.

"There is no mandate to make ash, oak and beech pay their own way," explains John Kennedy, Commissioner for Forest and Estate Management. "These species are planted where soil conditions are suitable for satisfactory growth. It is accepted that the financial return will be less than for conifers. While conifers are still planted on a very wide scale, the policy in the lowlands is to plant broadleaved species where they are an important feature in the landscape." Statistically, 77 per cent of all British forests are coniferous and 21 per cent broadleaved. The remaining two per cent are coppice, which are small trees grown for periodical cutting.

Most of Britain's major forest products companies do their best to avoid dealing in unprofitable native broadleaves, preferring instead to import the bulk of their raw wood requirements. The harvesting of broadleaves is left to the small or part-time operators who buy small stands, or perhaps just one or two trees, which they custom mill and market through local outlets. "Growing broadleaves cannot be justified on the production of timber alone," says Dr. Ray Torrain-Smith, a broadleaf expert from Bradford University. "Other amenities such as recreation, wildlife conservation, or soil fertility must play a part." Mark Anderson, the Forestry Commission's project manager for ecology, adds this observation: "Much of how people view hardwoods is historic and cultural, not economic."

Ideally it would seem that what Britain needs is a hardwood species that is both culturally acceptable to the general population and economic to harvest and market. One person who is trying to achieve such a compro-

Many British reforestation projects have featured "foreign" B.C. evergreens at the expense of Britain's traditional oak, elm and beech. Vast areas of Northumberland (above) in northern England, for example, are forested with Sitka spruce from B.C.'s Queen Charlotte Islands. By the late 1960s, public reaction to the evergreening of Britain caused the Forestry Commission to modify its reforestation programs to include more native hardwoods.

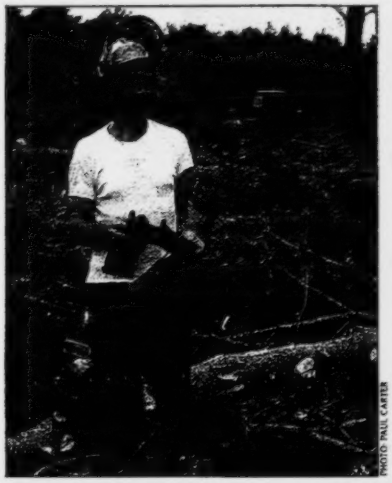


PHOTO: PAUL CARTER

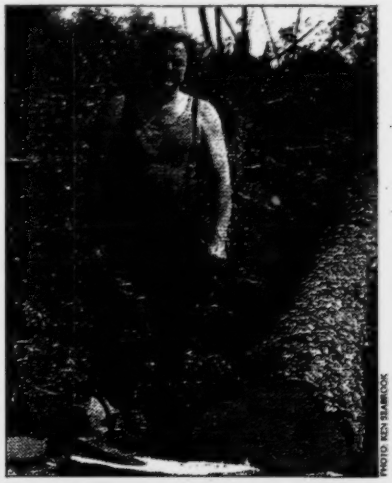


PHOTO: KEN SEABROOK

From Dwarfs To Giants

by **David Climenhaga**

PHOTO: DAVID CLIMENHAGA

They look like Japanese bonsai trees; these stunted little pines which huddle in the swamps and bogs around Prince Rupert. But "these horrible little dwarf things," as he fondly calls them, have a special place in the heart of Dr. Alan Fletcher. As homely as they may be in their natural state — the eternally-soggy environment of British Columbia's coastal northwest — the offspring of these little trees grow into hearty and commercially harvestable timber when planted in the right conditions in the long-deforested hills of Scotland.

British Forestry Commission forest geneticist Dr. Fletcher is no stranger to this province's forests; the portly, bearded Scot returns almost annually to hand-pick the seed he needs to continue his genetic and research work in Scotland. While sending experts all the way from Britain to British Columbia to pick a few cones may appear to be an expensive proposition, Fletcher notes there's a good reason for it:

"We're interested in specific seed that will do well in Scotland. What happens here is that you get only a few cones per tree — and they're all in this horrible muskeg. These trees are scruffy because, generally, the environment is bad. That means the cones have to be hand-picked by people who know what they're looking for; it gives us more control over our research. Once the seed is back in Scotland we plant it on well-prepared sites, especially on peat land in North Scotland, similar to the land here but drained, ploughed and fertilized."

The B.C. connection to British forestry goes back to 1935, when the British Forestry Commission purchased two and a half pounds of lodgepole pine seed from the Canadian government. Subsequent testing led to the realization that the shores of B.C. offered Britain the best source of seed for its ambitious reforestation programs.

"Sixty per cent of what we plant today is Sitka spruce from coastal B.C.," Fletcher notes. "Something like 10 per cent is lodgepole pine from the Skeena River area, and about three per cent of our planting program would use these little muskeg pine from right around Prince Rupert."

On his last B.C. trip, Fletcher collected seed from the area around Terrace and from Tofino on Vancouver Island, as well as from Prince Rupert and the Queen Charlotte Islands. The main hazard of fall cone-picking trips to British Columbia, especially the northern parts of the province, Fletcher concludes, is the constant rain. Of the time spent cone picking alongside the Yellowhead Highway a few miles east of Prince Rupert, he comments: "We were soaked through for about three days . . . I think everyone out there thought we were daft!"

mise is Forestry Commission silviculturalist Graham Tuley. "It could be possible to introduce a broadleaved species which will satisfy the aesthetic requirements of the public as well as render a profit when harvested," says Tuley, who is presently involved in a research program that could have far-reaching implications for hardwood forestry in England. He is examining the possibility of a large-scale introduction into Britain of two types of Nothofagus hardwood. Native to Chile, Nothofagus has the potential of reaching harvestability at least 30 years faster than Britain's indigenous species. Forestry Commissioner John Kennedy cautions, however, that although Nothofagus is a species with exciting possibilities, it is unlikely to replace Sitka spruce on the majority of sites.

While the Forestry Commission struggles with the task of making the most effective use possible of its forest lands, the fact remains that the forest area of Britain per head of population is one of the lowest in Europe, and the consumption of wood products is one of the highest. Great Britain therefore imports over 90 per cent of its timber needs, and supports a not insignificant forest industry. Employment figures for 1978-79 show 14,000 people directly employed in the wood processing industries. A further 19,000 people work in state and private forestry, making a total of 33,000 people involved in forest-related work.

To resolve the problem of producing enough trees to help keep these 33,000 people employed (while still protecting the traditional character of the British landscape), the Commission is striving to increase the productivity of its coniferous plantations in Scotland, Wales, and the north of England. Among other things, this means carrying out tree improvement research that will one day pay off in a better quality of tree being planted.

That explains why Forestry Commission researchers, following in the footsteps of David Douglas, pop up regularly along the northern coast of B.C. The Sitka spruce found here is tolerant of extremely wet soil and is hardy enough to resist exposure, so it reacts remarkably well when transferred to the climate and soil of the British moors and highlands. The Forestry Commission researchers

Working in the Forestry Commission's Thetford Forest, "forest craftsman" Jim Cater fells about 60 trees a day (opposite page top left). He practises a form of selective logging that takes into account the age of the trees and forest aesthetics. Logs are skidded along the flat Norfolk terrain by conventional rubber-tired farm tractors (bottom). Much of this pine timber is cut to length to be used for pit props in England's coal mines. The "offcuts" are sold to Bill Scots (top left), who operates a charcoal burner just outside the forest grounds. Planting in Thetford Forest is done by machine in ploughed furrows (centre). Logging on private land in Britain is carried out by independent contractors like "Jock" (opposite page top right), who has just felled a Scots pine on the Duke of Buccleugh's estate in Langholm, Scotland.

hand-pick seed from this and other B.C. tree species, taking it back to Britain to use in developing further research test plots.

The bulk of the seed used to meet Britain's current reforestation requirements is purchased from commercial seed firms operating in British Columbia and Washington. Overall, about 20,000 hectares are being planted in Britain; 12,000 hectares by the Forestry Commission and 8,000 hectares by private owners. About 80 per cent of this planting takes place in Scotland.

Although the Forestry Commission has enjoyed considerable success in transplanting B.C. trees to Britain, it has also encountered some perplexing problems. Pests and parasites not indigenous to British Columbia but present in the trees' new environment are a case in point. The Pine Beauty moth, which occurs on indigenous Scots pine but causes little damage, is often deadly to the imported lodgepole pine.

In the final analysis, the long-term solution to Britain's forestry problems will not be reached through silvicultural decisions alone. The Forestry Commission will still have to sort out the conflicting demands placed upon it by public opinion, national security and the economy. And while officials point with pride to the fact that trees planted in 1919 are now producing jobs for the people of Great Britain, if the Commission had stuck to its earlier plan of reforesting almost exclusively with B.C. evergreens, the forest landscape of parts of England in the year 2000 might have come to look more like that of northern Vancouver Island than the tabled hardwood domain where Robin Hood once rode. ☐

TREE IMPROVEMENT

"Trees are individuals," says Chris Heaman of the Ministry of Forests' Research Branch. "When you walk through a stand of trees, think of it as a crowd of people. Look for the variations."

This simple truth, that no two wild trees are alike, is the basis for one of the most significant forest management programs in British Columbia — tree improvement. Like the people who breed cattle, corn or Springer spaniels, tree breeders combine the most desirable characteristics from superior trees into an "improved" tree. The long-term goal is a forest where the trees are well-adapted to their growing sites, are healthy, fast-growing, straight, uniform in size and are of species that will sell well in forest products markets.

The B.C. forest industry already has begun harvesting second-growth trees which, because they are barely a century old, yield less wood per hectare than did the bigger old-growth trees before them. Part of the remedy for this reduction in timber supplies is to get second-growth forests to grow to a harvestable size more quickly. Through intensive forest management, including tree improvement programs, merchantable trees could be produced in some parts of B.C. in less than 50 years.

A sharpshooter shoots off a twig of a plus tree; the twig is grafted onto a seed orchard host tree, and all the characteristics of that plus tree are reproduced in the grafted tree.

BUILDING A SEED FACTORY

For years the Ministry of Forests' Silviculture Branch has gathered tree seed, raised seedlings in Ministry nurseries and planted these seedlings in the forest following logging operations. But now the branch has gone a step further by creating its own controlled source of mass-produced, improved seed — the seed orchard.

Reproduce The Best Trees

In the forest, the forester looks for large, healthy, well-formed trees called *plus trees*. Sharpshooters shoot off branchtip cuttings, called *scions*. The cuttings are grafted to the rootstock of seedlings. From the graft upward, the plant is genetically identical to the plus tree from which the scion was taken. Some tree species can be reproduced as cuttings, much the way African violets are. The genetically identical plants of a plus tree are called *clones*.

Plant The Orchard

The clones of these selected trees are planted together to form a seed orchard. The seed from these seed orchards will be used to grow tomorrow's forests.

(above) A seed orchard produces seed cones from the grafts of plus trees.

(right) The cones are hand-picked, dried, and tumbled in drums to separate out the seed. From that seed springs a new generation of trees.

BUILDING A BETTER TREE

Working alongside the Silviculture Branch, the Ministry's Research Branch has the job of coming up with genetically improved trees for future reforestation work.

Mating The Trees

When the clones in seed orchards (or in separate clone banks) begin to produce pollen and seed, selected individual trees are mated under carefully controlled conditions. Flowers, protected from random pollination by paper bags, are given selected pollen via a hypodermic needle. The resulting seed is collected and planted, and the information on each new seedling is carefully recorded.

Test The Offspring

The forester must know which plus tree traits are passed on genetically. So plus tree offspring, called *progeny*, are then planted in the wild to see how they perform. If a descendent of a selected plus tree grows well, the clone from that plus tree will stay in the breeding program. If it doesn't, all the grafts from that plus tree will be "rogued" from the seed orchard.

Reselection

Plus tree offspring which show up well in tests can then be bred with other selected progeny to produce the next generation of genetically improved trees. These will also form the genetic base for a second generation of seed orchards, and the whole seed orchard cycle and accompanying research work will begin again.

IT ALL TAKES TIME

The long-term objective of the tree improvement program is to provide enough improved tree seed to plant 120 million seedlings annually by 1995. Today, improved tree seed from Ministry seed orchards (and from forest industry seed orchards working in cooperation with the Ministry) figure in about five per cent of the province's current planting programs.

The Ministry of Forests' tree improvement work already covers the most important tree species now being planted: interior spruce, interior lodgepole pine, coastal Douglas fir and coastal western hemlock. Each tree improvement program takes time: it may be 30 years before useful results are available from a progeny testing program, and 30 years before seed orchards can produce significant quantities of seed. It could take up to 50 years before the work being done today will have its full impact on the B.C. forest landscape.

But the real payoff is this: tree plantations originating from improved tree seedlings can produce a marketable forest crop in 30 to 35 per cent less time than a plantation originating from unimproved seedlings. This makes tree improvement an essential element in the intensive management of B.C.'s forests.

A half-hour film on tree improvement is available from the Ministry of Forests. For further information, write:
Tree Improvement Film
Information Services Branch
Ministry of Forests
1450 Government St.
Victoria B.C. V8W 3E7

(above) Any tree in a seed orchard which isn't producing good-quality seed is rogued from the seed orchard during transplanting operations.

(right) The whole objective of the Ministry of Forests tree improvement program is to produce a better quality of tree for tomorrow's forests.

People

Vladimir Krajina

by **Gord Price**

PHOTO: K.T. CHALLENGER

Born in 1905 in a small Czech village that was part of Franz-Joseph's decaying Austro-Hungarian Empire, Vladimir Krajina was already internationally reknowned both as an ecologist and as a freedom fighter by the time he arrived in B.C. in 1949. Having already affected the course of history in ways few men ever can, he went on to revolutionize the way we manage land in British Columbia.

Every day 75-year-old Vladimir Krajina makes his way to a small, decaying hut at the University of British Columbia. He still puts in long days here carefully annotating reams of computer printouts containing information on over 2,500 species of indigenous trees, shrubs, plants, ferns and flowers. Having already catalogued the ecosystems of British Columbia according to an elaborate classification system, he now spends his time working out more of the details of the massive project.

Krajina's fascination with botany extends back to his childhood, when he would take long, instructive walks in the forest with his father, who was the village teacher and a leader in their Czech community. The seeds of interest thus planted matured quickly in fertile soil: Krajina had his Ph.D. with special honours at the age of 22, had organized an international scientific conference at 23, was classifying the flora of Hawaii and discovering new species at 24, and was head of plant ecology studies at one of Europe's oldest universities at 33.

Then came the Second World War. Krajina was one of six leaders in the Czech resistance. He organized his country's intelligence operations and supplied the Allies with more than 20,000 dispatches. The Germans were desperate to stop him; finally, through the use of an informer, the SS finally surrounded the city where he was hiding. At the moment of capture, Krajina swallowed a capsule of a potent and fast-acting poison. He was rushed to hospital where his stomach had to be pumped ten times.

Hoping to put his talents to use for their side, the Germans offered Krajina the leadership of a Czech puppet government. "Better for you to shoot me now," he responded, "than for me to be shot later by fellow Czechs." The SS fully intended to do just that; Krajina's name was first on the execution list at the concentration camp in which he and his wife were held. But literally hours before the scheduled execution, the German army seized the camp from the SS, cancelled the executions and shipped Krajina to another jail, where he remained until the war ended.

But the end of the war was not the end of his battles. Because he had been secretary-general of a central political party, he found himself fleeing the country on skis following the 1948 putsch which ended Czechoslovakia's short-lived democracy. Eventually Krajina made his way to London where he was congratulated

personally by Winston Churchill for his efforts during the war. Back home, however, he was somewhat less appreciated: the new communist government removed his name from every text and scientific reference. "I was raised to the level of an Orwellian no-man," Krajina observes sardonically.

By 1949 he had emigrated to Canada and begun teaching courses at U.B.C. in both botany and forestry. His impact was immediate and, for some, upsetting. "I was much younger in those days, with the attitude of a younger man," he recalls. "I was not necessarily rebellious, but I was not happy with certain forestry practices here, especially with the great wastage of material which should have been fully used, not spoiled by fire.

"I said slash fires should not be applied over the whole forest, but used only selectively, where they could do little damage to the humus. Everyone knows you need humus in your garden. I was even told by Mr. Clyne, one of the tycoons of MacMillan Bloedel: 'I can't understand the foresters who burn humus, while I have to apply it in my own garden.'

"But the attitude of the industry in those days seemed to be that if something couldn't be used, it should be burned. That was a subject of my criticism, and I clashed with the official views of the forestry faculty."

"He was a true prophet," recalls Hamish Kimmins, a U.B.C. forest ecology professor. "But few listened. He was a blunt, honest man who spoke his mind. He also raised antagonisms. He told some company chief foresters that if they practised in Europe the kind of forestry they were practising in this province, that would be reason enough to throw them in jail. Needless to say he became extremely unpopular with some people, but he had a vision, and went right ahead in what he believed in, irrespective of the consequences. I have fantastic admiration for him. He is a Churchill of the forest ecology world. He has vision, energy surpassing anyone else, commitment, and a sense of social responsibility."

From his position in the U.B.C. botany department, Krajina continued to teach that the forest should not be exploited without regard to ecology. The effect on his students was inspirational. "Krajina was the essence of what a university teacher should be," says Jack Walters, one of those students and today head of the U.B.C. research forest. "Every student felt Krajina was talking directly to him. His legacy to us is the well-being of our greatest natural resource, the forest."

Another of Krajina's students was Jack Toovey, today chief forester of B.C. Forest Products: "As forest management intensity has increased, the industry has caught up to Krajina. For instance, we have a program in our company that can be directly traced to his ideas, as do most forest companies." Toovey feels Krajina's greatest legacy is the 34 graduate students who are now scattered throughout industry, government and academia — the men who are applying their teacher's principles. One of these is ecologist Bruce Fraser, who is presently helping the Ministry of Forests set up a program to involve the public in planning forestland use. (See this issue's ForesTalk Interview.)

Perhaps Krajina's single greatest botanical accomplishment was his development of an ecosystem classification for British Columbia — a set of intricate biological blueprints that have built a bridge between ecology and practical forest management. He classified B.C.'s forests according to the inter-relationships of climate, soil and vegetation. "It is because of Krajina's work," notes Jack Walters, "and only because of Krajina's work, that the province is able to carry out its planned intensive forestry program on a sound ecological basis."

Partly in recognition of his landmark study *Ecology of Forest Trees in British Columbia*, Krajina was honoured with U.B.C.'s prestigious H.R. MacMillan Lecture in 1972. It was standing room only at the lecture, with people sitting on the stairs and crowding the hallways, testimony to the fact that both the man and his work were finally gaining some measure of the recognition they deserve.

Today the Ministry of Forests has over 70 researchers and field workers spread around the province, employing what is essentially Krajina's system to gather and analyze ecosystem classification data. This information in turn will enable foresters and other land managers to make more ecologically sound land-use decisions. For his part, Krajina has spent the past three years refining his system and working out a province-wide botanical index. Once completed, this work will help land managers analyze and understand ecosystems in much greater detail.

Certainly Krajina's most visible legacy is B.C.'s system of Ecological Reserves. These preserve both unique ecological areas and representative samples of the province's varying ecosystems for research and educative purposes. It was his enthusiasm, obstinacy and lobbying that helped convince former forests minister Ray Williston to set up an ecological reserve program in 1968, and led to the passage of the 1971 Ecological Reserves Act.

"We need to have these reserves to provide evidence as to how nature operated, how it operates, and how it will operate when left undisturbed and unmolested," explains Krajina. "There are now 99 of them, not necessarily large, but self-sustaining. And although the number looks impressive, we should have even more.

"As progress continues — and it will, because people would laugh if we tried to stop it — the question is: shall we and future generations have a better life? The answer, I am afraid, is not necessarily positive. Too much has been used in the forest and too quickly removed. It is questionable if people in the next century shall be able to harvest as much. Our tree plantations have to be perfected as nature was perfected. If not, our standard of life shall fall.

"Still, I am enthusiastic about our time. It is hectic but satisfying — providing you can freely express yourself. But you can have some good influence on future generations. I succeeded in my life more than I hoped for. I thought my ideas would be used in the next century, but they are being used now. And I am convinced, surprisingly, that my efforts weren't in vain."

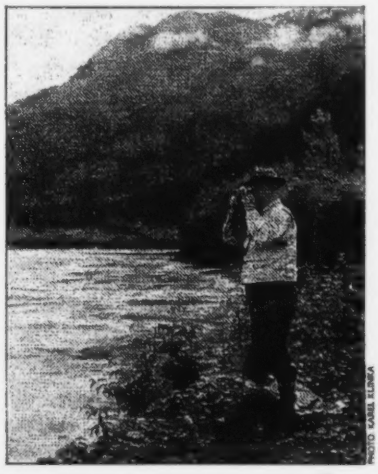


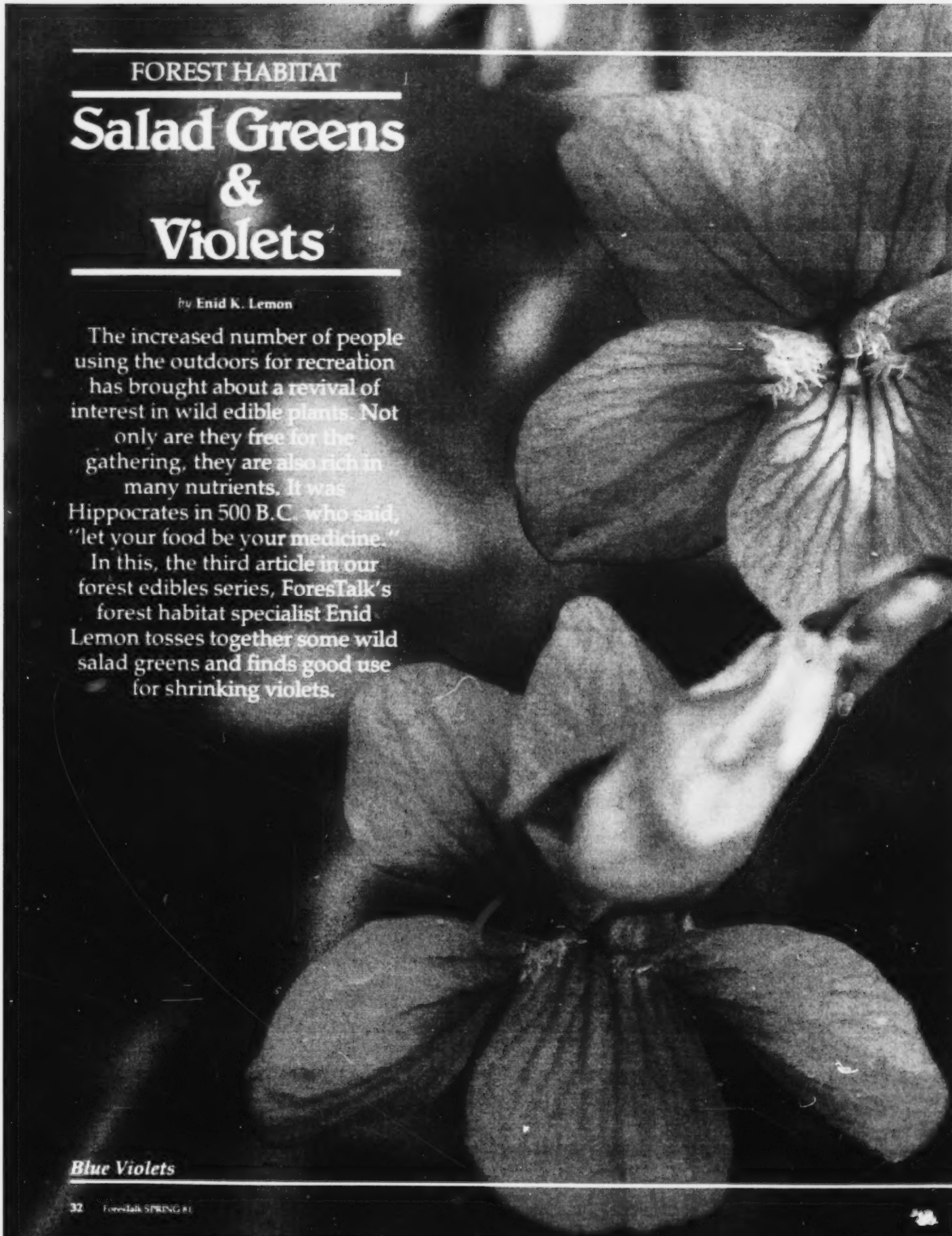
PHOTO KAREL KLINKA

FOREST HABITAT

Salad Greens & Violets

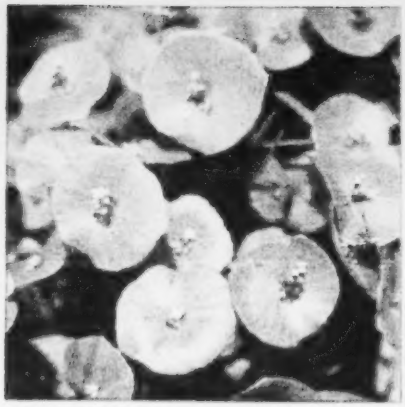
by Enid K. Lemon

The increased number of people using the outdoors for recreation has brought about a revival of interest in wild edible plants. Not only are they free for the gathering, they are also rich in many nutrients. It was Hippocrates in 500 B.C. who said, "let your food be your medicine." In this, the third article in our forest edibles series, ForesTalk's forest habitat specialist Enid Lemon tosses together some wild salad greens and finds good use for shrinking violets.



Blue Violets

Chickweed



Miner's lettuce

Siberian miner's lettuce

One of B.C.'s most common wild salad greens is chickweed (*Stellaria media*). This unpretentious plant is often referred to as the "poor relation" of the pink family, a grouping of 2000 or so mostly annual or perennial herbs but which includes in its family tree such plants as the familiar carnation. Chickweed is a lusty annual which starts its growing in the fall, vigorously defying sleet and snowstorms; it often blooms when the snow is still on the ground. Because it is so abundantly fruitful, it can be found in B.C. at almost any time of year.

Chickweed is not a spectacular plant. Its small, quarter-inch white flowers occur singly in the axils of the upper leaves. These five-petalled, star-like flowers open in the sun, but remain closed on cloudy or rainy days. Chickweed is a good example of a plant that "sleeps," for not only do the flowers close at night, but the paired leaves also fold over the developing buds. The plant's common name results from its association with songbirds and gamebirds, which eagerly eat the tender leaves and seeds.

In Europe chickweed has been used as a food for centuries; in fact, wherever Europeans have travelled, the useful chickweed has followed. Chickweed is an excellent source of vitamin C and is rich in iron. In the pioneer days its availability made this humble plant an excellent preventor of scurvy. Besides eating chickweed, the pioneers brewed the dried leaves into a tea, and they also used crushed, fresh leaves mixed with lard as a cooling application for skin irritations.

Miner's lettuce (*Montia perfoliata*) and its relative, Siberian miner's lettuce (*Montia sibirica*), are probably the best-tasting of the wild salad greens. Both species are native to B.C. and grow in shady forest habitats. Miner's lettuce is very easily recognized by the pair of leaves that fuse together part way up the short stem, forming a cup through which the plant stalk penetrates, and from the middle of which grows a compact cluster of small white flowers. Similar in appearance, Siberian miner's lettuce is best identified by the five-petalled white flowers with deep notches in each petal, and by the several reddish lines running the length of the petal. The stems are usually reddish in colour as well.

Miner's lettuce has a very definite place in North American history. Early records indicate that it was a popular edible plant with native Indians, and it was essential to the diet of many of the "Forty-Niners" who stampeded up the streams and mountains of California in search of gold. In their mad search, the miners had little time to worry about nutrition; many died of scurvy from lack of vitamin C. It took the native Indians to introduce them to this life-saving vitamin-rich salad. The plant has been known as miner's lettuce ever since.

British Columbia is home to 16 species of the familiar yellow, white and blue violets. In addition to their beauty, their leaves and flowers are excellent sources of vitamin A, vitamin C, and iron. Moreover, the more the flowers are picked, the more blossoms they produce.

Violets were frequently mentioned by Homer and Virgil because of their use by the Athenians as a medicine "to moderate anger, procure sleep and to comfort and strengthen the heart." It was also suggested that a "garland of violets worn about the head would dispel the fumes of wine, preventing drunkeness and hangover."

Ancient Britons used the flowers as a cosmetic. A Celtic poem mentions that the blossoms steeped in goat's milk and applied to the skin would increase female beauty. Throughout the Middle Ages violet preparations were used for a multitude of different illnesses, and violet syrup was held in great esteem by the ancient herbalists.

Candied flowers were much in vogue in the 17th and 18th centuries in Europe, and the cultivation of violets for candying and making perfume became a big business. Perfume from violets is still popular, and gourmet food stores still stock candied violets. But you can make your own candied violets, using either cultivated or wild species. Cultivated violets are more heavily-scented, a few of them added to a wild violet recipe will give the

Wild salad dish

mixture more body and fragrance. Violet flowers to be used for tea should be picked in the middle of the day when they are free from dew. Queen Victoria commanded the Royal Gardener never to be without fresh violets for tea, syrup, honey and jellies. These violets were, of course, the cultivated varieties, but you can also use wild violets to make syrup, jams and jellies.

In old herbal books you will find a preserve called "violet sugar" or "violet plate," which is very similar to violet jam. It was used by the apothecaries during the reign of Charles II as not only a sweetmeat but also a remedy for all the chest complaints from bronchitis to consumption. It would be hard to find a more pleasant way of taking an herbal medicine — it has the sugar-coated pill beat by a mile!

While there are many other uses for violet blossoms, the plant's leaves are also nutritious, rich in vitamin A and vitamin C. Use the leaves in your salad, but remember that, like other green vegetables, violet leaves may be slightly laxative. Only eat a few the first time you taste these delectable greens.

With their high vitamin content, violets are an excellent tonic to help us resist the infections which seem to appear each spring. Violets can surely be described as "nature's vitamin pill," and they are free for the picking.

Kitchen Hints for Forest Edibles

Wild Edible Etiquette

First, be sure of the identification of your wild plants. The best way is to find a friend who is well versed in the subject; otherwise, consult a reliable book. One of the best is *Edible Garden Weeds of Canada* by Adam F. Szczawinski and Nancy J. Turner, published by the National Museums of Canada. Second, when picking wild plants, always watch out for contamination from sprays and pesticides. Third, get to know the common poisonous plants in your area. Fourth, use recipes which have been tried out by others. Finally, remember that our modern stomachs are not necessarily used to eating the plants that sustained the pioneers, so eat small samples at first.

Tossed Chickweed Salad

Chickweed is delicious in a tossed green salad. Pick the young shoots, rinse the flowers, leaves and stems and cut or tear them into small pieces. Use an oil and vinegar dressing. Being so tender, chickweed cooks almost instantly. Add butter and salt after cooking. And to add a little zip — why not try a sprinkling of your favourite cheese?

Miner Masterpiece

For a miner's lettuce salad, mix 4 cups of the lettuce and chopped stems with two chopped hard-boiled eggs. Moisten with 4 parts oil and 1 part tarragon vinegar, salt and pepper to taste. Eat as soon as possible after adding the dressing — before the crispness goes out of the leaves.

Candied Violets

Make a syrup of 1 cup granulated sugar and ½ cup of water. Boil until it spins a thread. Cool to room temperature. Using tweezers, dip the whole flower into the syrup, shake off the excess and dip into fine granulated sugar. Place on waxed paper to dry. Candied violets are delicious eaten as candy, or they can be used to ornament a green salad or a cake.

Violet Jam

Use 1½ cups of tightly packed blossoms. Put violets and ¼ cup of water and 2 tablespoons of lemon juice into a blender and blend at high speed for 1 minute. Add 5 cups of sugar and blend for another minute. Stir a package of pectin into ½ cup of water and boil for 2 minutes, stirring constantly. Pour this hot mixture into the blender and blend for 2 minutes. Pour into sterilized jars and seal. This jam will keep for about 3 weeks in the fridge, and can be frozen. Few vitamins are lost in the freezing process, and you retain the violet flavour, especially if you add a few blossoms from the stronger-scented cultivated varieties.

Violet Syrup

Violet syrup is made by filling any sized jar with violet flowers and covering them with boiling water. Put on the lid and leave for 24 hours. The next day, strain the infused liquid and throw away the flowers. To each cup of this violet extract, add the juice of ½ lemon and 2 cups of sugar. Bring to a boil, then pour into sterilized jars and seal.

Province of British Columbia
Ministry of Forests
HONOURABLE TOM WATERLAND, MINISTER

THE OCEAN-LOVING SPRUCE

Along with Douglas fir and western red cedar, Sitka spruce trees are the lords of the Pacific coast rainforest. Specimens 300 feet high and 15 feet through grow right to the ocean shore. From Alaska to Oregon they grow almost to high tide line, and along river banks washed by the ocean tide.

The Sitka spruce takes its name from the capital of Alaska when that territory was still a Russian colony. Archibald Menzies, surgeon and botanist aboard Captain Cook's Discovery, reported its occurrence in 1792; it has long since become an important commercial species. Most notably, thousands of wartime planes were made from Sitka spruce wood, as pound for pound it is stronger than steel.

The needles of the Sitka spruce are bluish-green and sharp to the touch; the thin scaley bark is reddish-brown; the cones are broad and cylindrical. West Coast Indians traditionally have made baskets and other household articles from the Sitka spruce's pliable roots and smaller branches.